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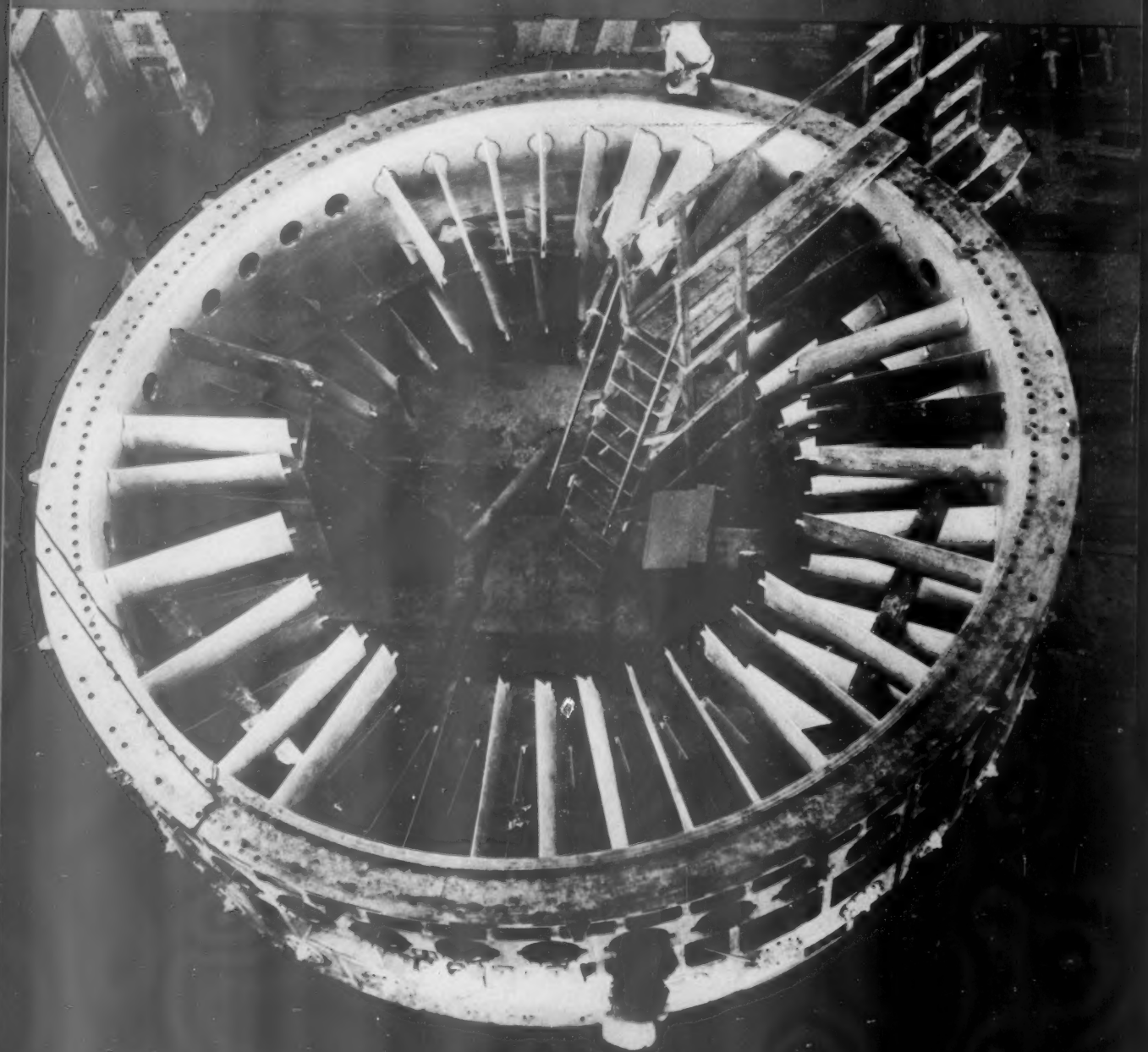
THE WELDING ENGINEER

NOVEMBER, 1953

Russian Welds—
Good and Bad . . . page 32

Collision Reveals Strength
of a Welded Ship . . . page 24



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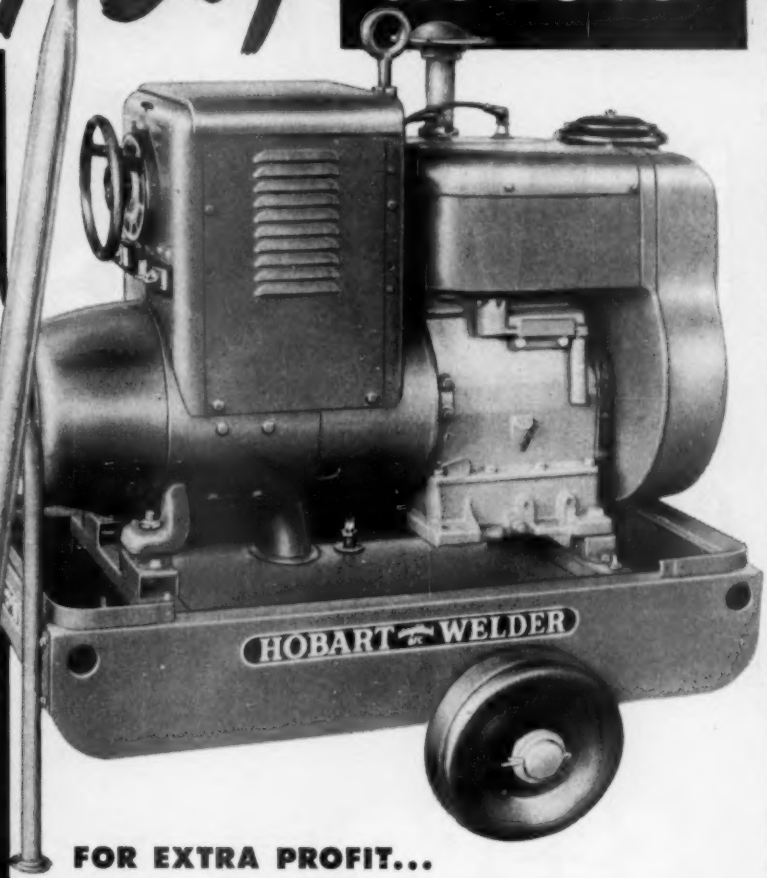

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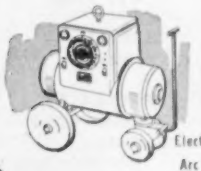
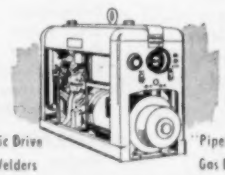

Electric Drive Arc Welders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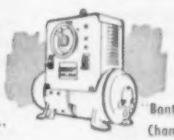
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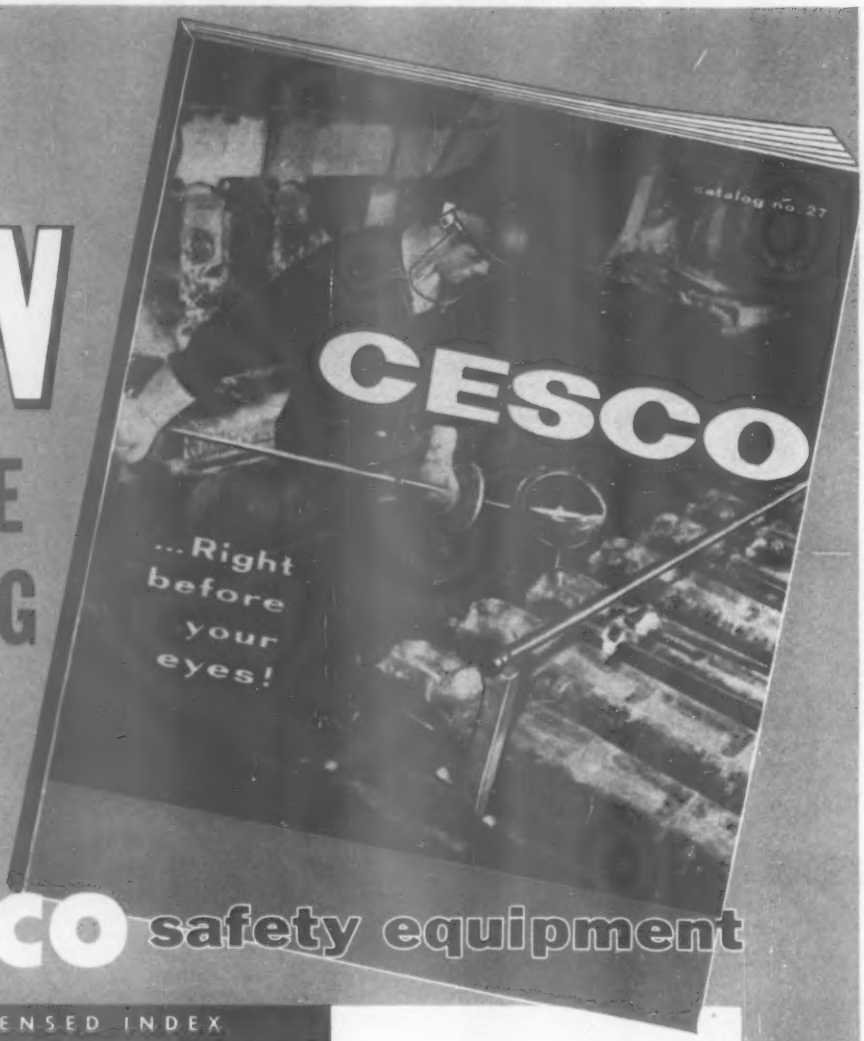

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NOVEMBER, 1953

Cover: Giant ring is one of eleven similar rings for carrying stator blades in compressors being constructed by Westinghouse for the Air Force's new wind tunnel. The bearings in which the large blades are mounted are held in place by circles of welded studs (see page 35). Nelson Stud Welding photo.

FABRICATION

From Steel Plant to Texas Tunnel **23**
Clyde B. Clason

Save $100,000 at Tornado Town **35**

RESEARCH

Collision Reveals True Story of Welded Ship Construction **24**
T. D. Beery and LaMotte Grover

How to Weld 430 Stainless **42**
Lester F. Spencer

MAINTENANCE

Tailor for Tractors **26**
Fred M. Burt

JOB SHOP

Welding Goes Underground **28**
David Lewis

PRODUCTION

Production Went from 9 to 25 Frames Per Hour **30**
John S. Lentz

MILITARY

Russian Welds—Good and Bad **32**
Herman C. Phelps

CONSTRUCTION

Tapered Roof Girders Called "Revolutionary" **36**
James Joseph

OPERATION

Back-up Flux: New Aid to Welding **38**
Alvin L. Bennett

DEPARTMENTS

News 5
Welding Info-Aids 17
Editorial: Give Thanks for Our Discontent 21
Old Ket Shoots the Wad 41
Data Sheet No. 158: Product Specifications—Magnesium Alloys 51
On the Job 56
New Products 60
Letters to the Editor 74
People 89
30 Years Ago 94
Patents 95
Where to Buy 102
Searchlight Section 102
Advertisers in This Issue 104

THE JACKSON

New Lift-Front Helmet

See it...Try it

✶ Plastic Lens Holder

✶ Improved Helmet Shell

✶ Improved Headgear

✶ **Lens Holder** has hinged front, holding welding lens and cover glass. It permits inspection of work without raising the entire helmet—a great advantage, especially for work in close quarters. Made of high-impact, compression molded, thermosetting plastic, it is strong and durable. Coil springs are built inside the hinges to hold front up or down. Another clear glass is held in aluminum inner retainer and stays in fixed position to keep out flying particles. All glasses are replaceable without tools.

ARC WELDING HELMET
with Lift-Front ..... Type **H-2**

ON BOTH JACKSON HELMETS . . .

✶ **One-Piece Helmet Shell** is now made of a thermosetting plastic, reinforced with glass fiber, combining all the advantages of resistance to heat, moisture, high voltage and spatter with even greater strength, and even better appearance than before.

✶ **Headgear** has wider and more flexible straps for greater comfort, made of smooth plastic, easy to clean. There's no trial-and-error adjusting it to size. Calibrated to hat sizes in ½-inch increments, it is quickly made to fit before putting it on. The cork padded sweatband, held by snap buttons, is inexpensive to replace.

Try on either Helmet. You, like other weldors, will particularly like the Jackson-developed friction pivots. They are easily adjusted to your needs, by hand, from the outside, without taking the helmet off. The helmet can thus be made to float down without jolting stops, or to stay in any desired position. This unique feature eliminates the need for chin straps and other cumbersome inside gadgets.

Cover glass slides out without disturbing the filter lens . . . Plastic shell swings up on adjustable friction pivots.

Now—Lighter than Ever!

Jackson's *stationary-front helmet*, the first with a one-piece thermosetting plastic shell, is now, with its new, light metal lens holder, being made lighter than before.

With its new shell and improved headgear, it will win friends among weldors everywhere.

ARC WELDING HELMET
with Stationary Front.....Type **H-1**

Sold world-wide through distributors and dealers. Jackson Products, foremost makers of arc welding electrode holders, ground clamps and cable fittings, also manufactures a line of gas welding goggles, grinders' goggles, eye and face shields.

JACKSON
PRODUCTS
WARREN · MICHIGAN

INERT gas is stored in banks of manifolded cylinders

INCREASE in production called for more floor space

NEWS

Cascade System for Storage of Argon

AN estimated $5,000 per month will be saved by a new argon gas storage and distribution system recently installed by Ryan Aeronautical Co., San Diego. The new system is a 52,000-cu-ft storage facility composed of 186 steel cylinders manifolded together in three banks. From these, Ryan has installed a network of 3,800 ft of extra-heavy steel piping to feed argon gas to every welding booth in all its buildings.

Previously, individual cylinders were used at a rate of 572 per month. In order to provide a ready supply, they were stored inside the plant. This presented a safety hazard as each cylinder was charged to a gas pressure of 2,200 psi.

Ryan has converted all of its fusion-welding stations to inert-gas welding (both tungsten and metal-arc processes are used). Ryan's 169 fusion-welding stations consume more than 2,000,000 cu ft of inert-gas a year.

With the new argon gas storage system, while one bank is being replenished, another is being used to feed the plant. The third bank is used as a standby supply. Interruptions previously caused by local gas shortages and shutdowns will thus be abolished.

The pressure of argon is regulated to 25 psi as it leaves the storage system, and no further regulation is required at the welding booths. The stations are equipped with timers that automatically control the flows of argon and cooling water during the welding process. Their action is designed to provide a timed gas flow after welding ceases, thus protecting the hot electrode from oxidation. Because they save substantial amounts of gas, these timers pay for themselves in 60 days of use.

* * *

Naval Architects Meet

THE 61st annual meeting of The Society of Naval Architects and Marine Engineers will be held Nov. 11 through 14 at the Waldorf-Astoria Hotel, New York City. The society, founded in 1893, now totals more than 6,300 members.

Why Metals Are Short

ACCORDING to Army Ordnance personnel, in just one M-48 tank there are 4,000 lb of aluminum, 1,000 lb of copper and 1,400 lb of cast iron. And, believe it or not, these metals comprise only 5% of the total weight of the combat vehicle. The other 95% consists mostly of steel.

When you multiply these figures by the number of tanks the Army has (a military secret), you begin to realize why critical shortages occur during national emergencies.

War is the great consumer of metals. As threat of war lessens, we may look to see many metals become more plentiful. Already the tightness of nickel has been alleviated by the action of Secretary of Commerce Sinclair Weeks revoking controls over its use in civilian economy, effective Nov. 1.

National of California Acquires New Buildings

APPROXIMATELY 16,000 sq ft of floor space was acquired by National Welding Equipment Co., San Francisco, with the recent purchase of buildings adjacent to its present plants.

Of the total, about 1,700 sq ft will be used for display. The shop will be enlarged by nearly 10,000 sq ft, while the storerooms will get an added 2,200 sq ft. The engineering and development departments will be expanded by 2,200 sq ft of floor space.

The added area is partially required for the immediate expansion of production.

* * *

Welded Texas Bridge Wins First Prize

A CONSIDERABLE amount of welding went into the construction of a Texas bridge that recently won a first prize in the American Institute of Steel Construction's 25th annual aesthetic bridge competition. The Neches River Bridge at Beaumont, Tex., has more than half of its cover-plated beam flanges, diaphragm and beam splices either shop or field welded. Field connections for bracing the rest of the bridge are also welded.

The Texas structure was winner in Class II (for bridges under 400 ft, costing more than $500,000).

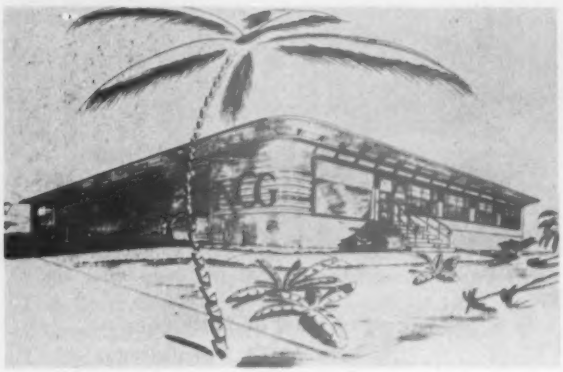
* * *

New Packaging Method for Hardfacing Rods

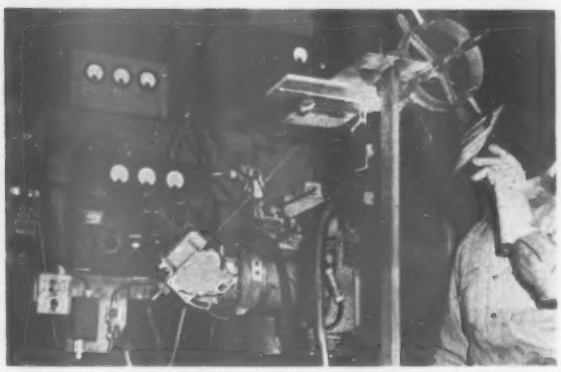
PROTECTION from shipping damage is offered by a new packaging method employed by Rankin Mfg. Co., Los Angeles, manufacturers of hardfacing electrodes. The rods are packed in a wooden box, which will resist moisture. Convenient to store, the box is also a handy container from which the weldor can work. Empties make good storage boxes for parts and other material.

NEWS

from page 5



ARCHITECT'S drawing of new NCG warehouse and plant



OVERHEAD Mig welding of aluminum plate at Alcoa lab

New NCG Office in Tampa, Fla.

SHORTLY after Nov. 1, the Tampa district office of National Cylinder Gas Co. was to have moved into its new quarters at Fourth Ave. and 31st St. This new 7,800-sq-ft building will provide space for office facilities, the Tampa warehouse and plant facilities for producing nitrogen and oxygen.

* * *

IAA Asked to Approve New Navy Torches

WELDING and cutting torches designed by the Navy have been forwarded to the International Acetylene Association for review and possible recommendations. When the IAA completes the task, manufacturers can expect inquiries from all branches of the armed forces regarding the procurement of these new torches.

The new torch will eventually replace all proprietary types of medium and heavy-duty cutting and welding torches used by the military.

* * *

Chemical Towers Lined with Nickel-Base Alloy

Two large towers completely lined with a nickel-base alloy have just been installed at the new Tuscola, Ill., plant of National Petro-Chemicals Corp., according to the *Haynes Alloys Digest*. The plant will extract ethane from petroleum gas and convert it into chemicals. The lining will insure maximum corrosion resistance.

These large towers were designed by Vulcan Engineering Division of Vulcan Copper and Supply Co., Cincinnati, Ohio, and were fabricated by Graver Tank and Mfg. Co., Inc., East Chicago, Ind. The entire surface of the towers was lined with alloy strips ⅛ in. thick by 8 in. wide. These were fillet welded to the 0.92 and 0.82 in. shell of the towers with 310 stainless steel welding rod. Liner spacings and the weld seams to the steel were then covered with 1½-in. wide nickel-base alloy strips. These were welded over the seams with the same alloy rod, using the inert-gas welding method.

All of the uncovered welds were made on top of the alloy to avoid diluting the base metal.

Alcoa Experiments with Overhead Mig Welding

RESEARCH on overhead Mig (metal inert-gas) welding of aluminum plate is being carried on at the Alcoa Research Laboratories, New Kensington, Pa. Experiments with ½-in. thick 52S ½-hard aluminum plate are being conducted. The machine doing the job requires 500 amp and 29 volts. It has a travel speed of 18 in. per minute. The filler wire being used is 1/16-in. 52S.

Donald C. McGraw Elected President of McGraw-Hill

DONALD C. MCGRAW was elected president of the McGraw-Hill Publishing Co., Inc., at a recent meeting of the board of directors. He succeeds his brother, the late Curtis W. McGraw.

The new president, youngest son of the late James H. McGraw, Sr., founder, has been associated with the company since 1919. He has been a director since 1935 and vice-president since 1945. A native of Madison, N. J., Mr. McGraw is now a resident of Summit, N. J. He is a graduate of Lawrenceville School and attended Princeton University. He served with the U. S. Navy during World War I. During World War II, he was a consultant to the publishing and printing division of the War Production Board.

Mr. McGraw joined McGraw-Hill in 1919 as a member of the advertising staff of *Chemical and Metallurgical Engineering*. Since 1933, when he was made secretary of the company and put in charge of production and manufacturing, he has been responsible for the handling of all contracts for printing and binding, engraving and paper supply for the entire McGraw-Hill operation.

In 1945, he was named vice-president for manufacturing and general services, the position he held until his election as president.

Succeeding Mr. McGraw as vice-president for manufacturing and services of the McGraw-Hill Publishing Co., is Hugh J. Kelly. Mr. Kelly has been senior vice-president and business manager of the McGraw-Hill Book Co. since 1946.

(More News on page 79)

One of the several reasons why it is such an effortless pleasure to adjust a National regulator tension screw to any desired delivery pressure setting is the nylon bearing. Of course, another important reason is the fully sealed tension screw bearing section which permits neither dust nor grit to enter; it assures sealed in smoothness. . . .

Why not try out a National regulator, single or two stage reduction, it's worth your while, we assure you.

Write for the fascinating story on regulators. 44 fact packed pages of interest.

Made by National SINCE 1910 **WELDING EQUIPMENT CO.**, San Francisco 5, California

830

Welding Arcs

Now—reliable, high-speed welding of aluminum and stainless steel*

New G-E Fillerarc Equipment makes a production reality of the consumable electrode gas-shielded welding process

Two years ago, General Electric welding engineers took on a challenging assignment: to develop equipment for consumable electrode gas-shielded welding that would be as dependable and trouble-free as conventional arc welding equipment.

Product of their success is the new G-E Fillerarc equipment which today makes available to American industry the full potential of this amazing process.

G-E Fillerarc equipment offers you:

VERY HIGH SPEED—wire speeds up to 750 in./min, highest ever on a production welder of this type.

WIDER USABILITY—far smaller wire can now be used, permitting welding of very thin sheets.

REAL DEPENDABILITY—unique design features minimize trouble, slash maintenance costs.

UNMATCHED RESULTS—current is automatically supplied for any wire speed, assuring high-quality work.

LOW PRODUCTION COSTS—due to very high speed, minimum operating trouble, increased flexibility.

EASE OF OPERATION—semi-automatic features make Fillerarc welding simple and easy to learn.

Additional information on this amazing new equipment is contained in these two bulletins:

GEA-6028 Fillerarc Welding Equipment
GER-819 Fillerarc Welding Process

They're available from your nearby G-E Welding Distributor. He's listed here and in the yellow pages of your phone book under "Welding Equipment—General Electric." Contact him today! General Electric Company, Schenectady 5, New York. 710-6

***Plus other metals including copper, nickel, and magnesium bronze.**

GENERAL ELECTRIC

News

Information on equipment, electrodes and accessories from G.E., pioneer in arc welding

Radically new designs fulfill needs of Fillerarc process

NEW FILLERARC WELDER MINIMIZES STUBBING, BURN-BACK

Here is the first self-regulating welder. Designed specifically for consumable electrode gas-shielded welding, it has a rising volt-ampere characteristic which automatically avoids burn-back and stubbing troubles, permits changing wire speed and current without adjusting the generator.

Other features:

- Self regulation—insures proper current for any wire speed.
- Low open-circuit voltage—makes accidental burn-back unlikely.
- Controlled current surge—for easy starts without scratching.

NEW FILLERARC GUN FEEDS SMALLER WIRE BY PULLING

To overcome limitations on wire size caused by kinking, the Fillerarc gun is designed to **pull** wire into the gun. Result: the gun uses wire as small as .030 in., permitting the welding of far thinner sections than before.

Other features:

- Light in weight—50 ounces including normal unsupported cable.
- Simple trigger—for positive starts, automatic gas coverage.
- Easy threading—changing wire takes but a few minutes.

NEW FILLERARC WIRE DRIVE CONTROLS SPEED PRECISELY

To match other precision components, G-E engineers selected a G-E Thy-mo-trol† drive for accurately controlling wire feed. Remote control dial at work permits changing speed even while welding.

Other features:

- Dynamic braking — eliminates wire trimming before each start.
- Continuous wire-speed indication —no need to time and measure.
- Easily portable—weighs only 142 lb including wire, mounted on casters.

†Reg. Trade-mark of General Electric Company

Here's the name of your G-E Welding Distributor—

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo—Hendrie & Bolthoff

Florida: Hollywood—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton, Rockford—Machinery & Welder

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Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

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New Mexico: Albuquerque—Industrial Supply Co., Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

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North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply; Fargo—Dakota Electric Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Allentown, Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo, Hereford—Tex-Air Gas; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa—Western Oxygen; Pecos—Welding Supply Co.; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Snyder—Western Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

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Virginia: Richmond—Arcway Equipment

Washington: Seattle, Spokane—J. E. Haseltine; Spokane, Yakima—Industrial Air Products

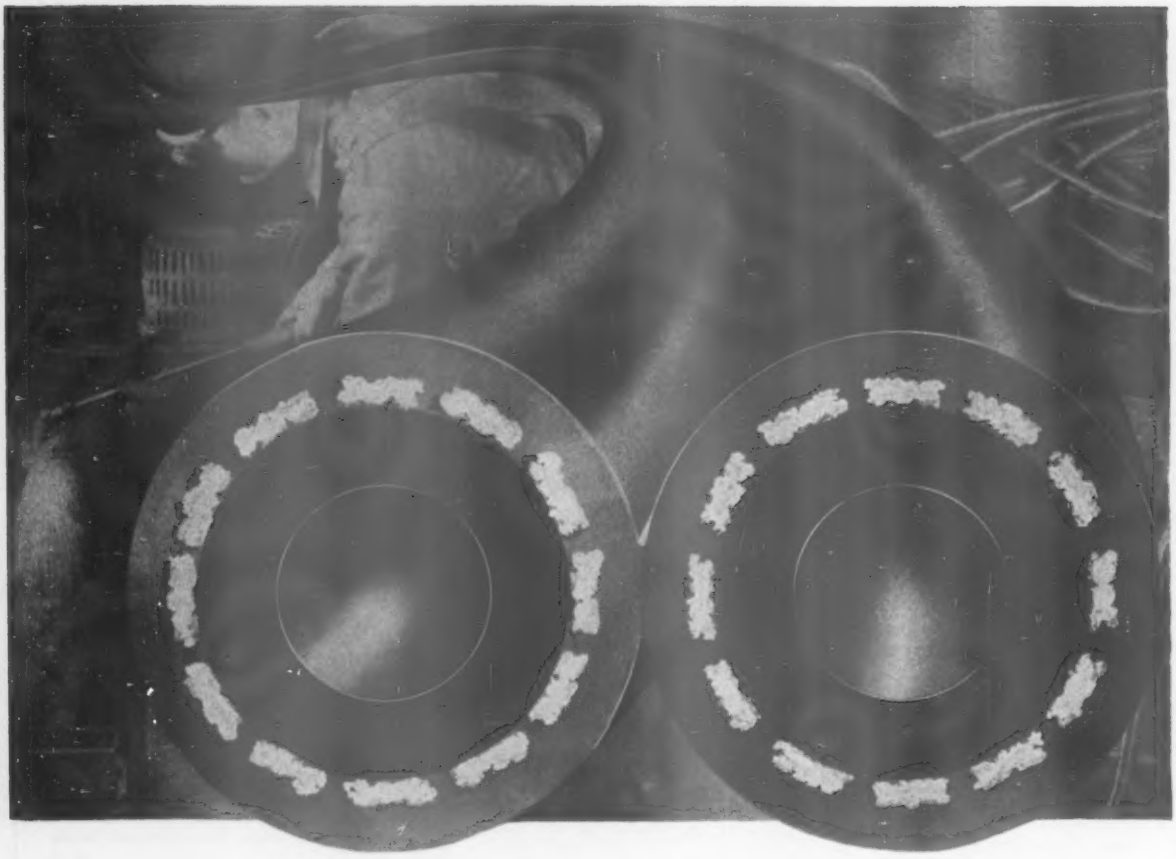
West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan Hardware & Supply

Wisconsin: Milwaukee—Machinery & Welder

Alaska: Anchorage—Northern Supply

Canada: Toronto—Canadian G.E.

Hawaii: Honolulu—American Factors, Ltd.



NOW BETTER THAN EVER

Hewitt-Robins Twin-Weld Hose Offers Values Found in No Other Welding Hose

Twin-Weld® —the original twin-line welding hose, preferred by over 7 out of 10 users—is now four ways better.

Twin-Weld is non-porous . . . it eliminates welding inefficiency, explosions and fires.

Twin-Weld has a greater ease of handling . . . eliminates tangling, assures flexibility. Twin-Weld has the important advantage of being a "straight-cure" hose; it won't snake.

Twin-Weld eliminates tangled lines. Its two lines are firmly bonded together, yet easily separated by cutting with a knife.

Twin-Weld Hose incorporates principles of construction and methods of manufacture which are exclusive with Hewitt-Robins. It is safer, longer-lasting and now has a new neoprene flame-resistant cover.

O.D.'s now conform to IAA specifications—7/16", 17/32", 19/32" . . . I. D.'s 3/16", 1/4", 5/16".

Get the facts about Hewitt-Robins Twin-Weld Hose. Write for Bulletin No. H-4a. Or contact your local Hewitt Rubber Distributor (see "Rubber Products", Classified Phone Book).

HEWITT HR ROBINS

Executive Offices, Stamford, Connecticut

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam

FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

AMSCO V-MANG

The new moly-manganese electrode that's better than nickel-manganese rods for build-up and repair

Comparison of yield and tensile strength

For full engineering and metallurgical information on Amsco V-Mang, write for technical data sheet to Amsco, Chicago Heights, Illinois.

- TOUGHER DEPOSIT
- BETTER WELDABILITY
- HIGHER YIELD STRENGTH
- LESS CRACKING

AMSCOATING
THE RIGHT WAY TO SAY HARDFACING

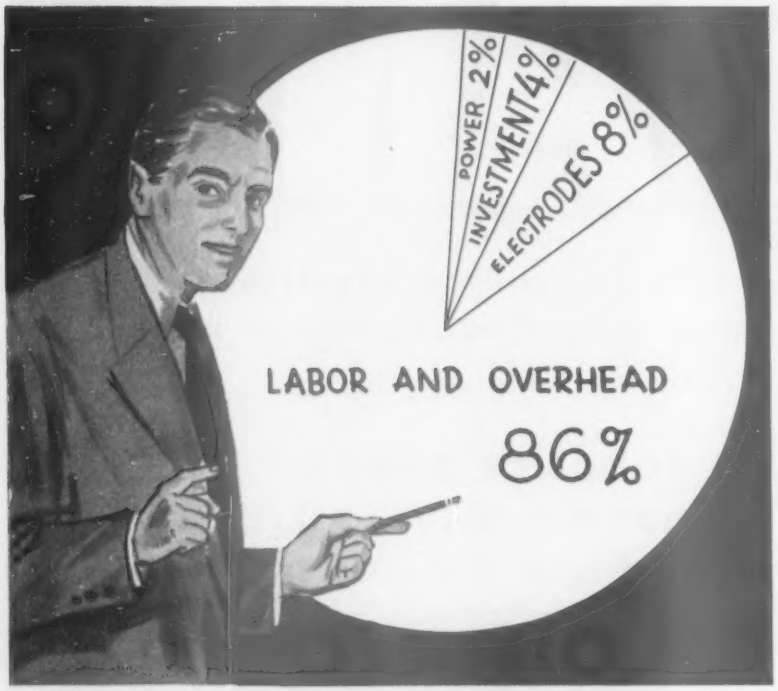
AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
382 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.

LET'S FACE FACTS

86¢ out of every welding dollar goes for labor and overhead. *That's* the place to start cutting costs



Check your own records. You'll find that 86% (or close to it) of welding costs go for labor and overhead, 8% for electrodes, 2% for power, and 4% for investment. As a result, every piece of welding equipment (electrodes or machines) you buy must be bought for what it does to *speed* your welding, if costs are to be cut substantially. That's exactly where Lincoln can do a job for you . . . today.

As an example, *total* welding costs for one year for a single operator and machine can be as high as $9,920. The place to start cutting costs with Lincoln welding equipment is in the approximate $8,531 that goes for labor and overhead.

Designed specifically to operate at higher currents than other rods, Lincoln electrodes enable you to *take full advantage of the extra welding capacity* . . . the extra performance built into your Lincoln machines. *Resulting cost reductions can average from 10% to 25%, including labor, overhead, power, and cost of electrodes.* "Fleetweld's" greater freedom from coating breakdown at high currents means less pin holing, less spatter . . . *top quality, high strength welds without sacrifice in speed.*

Listed at the right are E-6012 and E-6013 electrodes. Each is designed for a specific type of production job for one purpose only . . . to cut into the 86¢ out of each dollar that goes into your welding costs.

Get Lincoln's Cost Saving Facts. Let our field engineers show you how to *save hundreds of dollars each year,* per man, by utilizing cost-cutting procedures.

LINCOLN FLEETWELD Specialized Welding Electrodes for Top Speed . . . Quality Production

STRUCTURAL . . . bridges, buildings, ships.
"FLEETWELD 7" E-6012 electrode designed for speed and ease in all three positions . . . flat, vertical, overhead. High melt-off rate and low spatter loss. Exceptionally good for work where fitup is poor. For DC or AC.

PRODUCTION . . . machine parts.
"FLEETWELD 72" E-6012 for high-speed downhand welding in flat and horizontal positions. Welds 35% faster . . . operates beyond breakdown point of other E-6012 rods. Good "wetting" action with high melt-off rate and flatter bead give *more mileage* per rod. For DC or AC.

SHEET METAL . . . thin gauge steel.
"FLEETWELD 37" E-6013 for mild steel or low alloy of ¼" thickness or less. Good build-up with little tendency for burn-through where fitup is poor. Exceptionally good slag control in all positions . . . especially in vertical down welding. For DC or AC.

HEAVY MACHINERY. . . bases, frames, columns.
"FLEETWELD 47" E-6013. A standard priced electrode with premium performance. (Most 6013-type rods are priced considerably higher.) Exceptionally smooth bead . . . welds are self-cleaning. Good control of bead shape on large fillets in all positions. For DC or AC.

HOW TO PLAN SAVINGS OF 10% TO 25% IN TOTAL WELDING COSTS

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

The chart at the left shows the breakdown of the welding dollar that goes into fabrication costs. As a result, it helps you *evaluate the real worth* of various welding machine features when forming your plan to cut overall costs 10% to 25%.

Labor and Overhead. By far the largest share of total cost, labor and overhead depends directly on welding manhours. Obviously the most effective way to cut welding time is to boost welding speeds, which calls for higher currents.

With Lincoln machines you have the *extra* reserve current capacity for these higher currents. More useable amps, completely guaranteed against burnout by thermostatic protection, enables your welders to maintain the higher speeds. But, that's not all.

Exceptional versatility in welding gives your operator ultimate flexibility in meeting every condition of weld position and type of joint. Dual Continuous Control with Job-Selector on DC Lincoln "Shield-Arc" machines gives instant selection of the right type arc as well as right arc intensity. On AC Lincoln machines, "Fleetwelder's" Arc-Booster starts the arc automatically . . . eliminates electrode sticking regardless of current setting.

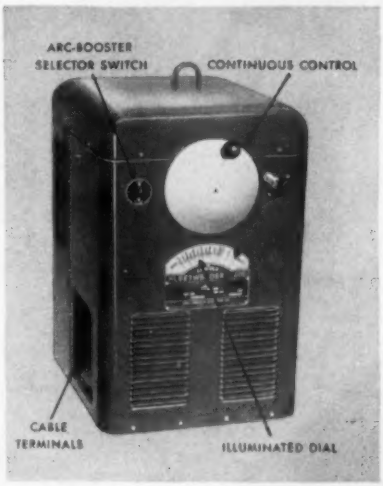
Power. Only 2% of total costs go for power. Input amps for idling are, therefore, negligible, considering the added current capacity in useful welding amps that are attained through Lincoln's advanced designs of AC and DC machines.

Electrodes. Added savings in welding cost are realized through Lincoln's low electrode prices. But, more important are net benefits through higher welding speeds since "Fleetweld" rods operate at higher currents without breakdown in coating and tendency to pin hole.

Investment. Lincoln machines sell for less than other welding machines of comparable capacity to keep your investment down. However, add this to lower maintenance costs on Lincoln machines. Lincolns cost less to run because operating parts like bearings and shafts are "beefed up" to work continuously day after day without breakdown.

AC OR DC...

It takes Lincoln's higher capacity to really lower welding costs



FLEETWELDER NEW DESIGN AC WELDER

Lincoln "Fleetwelder" built for highest speed—lowest cost manufacturing with AC.

Available in 300, 400, 500 amp sizes.

Has Lincoln pioneered Arc-Booster for instant starting arc.

Heavy duty construction with complete protection for long sustained overloads.

LEADS THE FIELD IN AC WELDERS

Still Industry's Standard for DC Welders

LINCOLN "SHIELD-ARC" WELDERS

For *greatest* reduction in welding costs

Versatile . . . has Dual Continuous Control for quick job selection.

Highest overload . . . with thermostatic protection against burnout.

Available in 200, 300, 400, 600, and 900 amp sizes.

Performance proved . . . Twice as many Lincoln DC welders are bought each year than all other DC welders combined (including rectifiers).

CHECK LINCOLN'S COST-CUTTING FACTS TODAY—*Send for Bulletin 1314 on "Fleetwelder" AC and Bulletin 459 on Lincoln "Shield-Arc" DC. Dept. 1711*

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

Foot and Leg Protection

It's Foot-Snug . . . Always!

NEW AO SPAT with special flare

gives greater safety

OUTSIDE VIEW

INSIDE VIEW

You're looking at a new idea in spats — featuring three stays instead of a spring clip on the flare. We developed this for very hot jobs where curling up of the flare is a hazard. The stays on this new spat (AO 7X171) *keep the front of the flare snug against the foot despite intense heat* — always. Your nearest AO Safety products Representative can supply you.

QUICK FACTS

- Chrome tanned cowhide
- Elastic top for snug fit
- Buckle and strap go under shoe to hold oak tanned leather flare
- Leg portion held in place by two arctic buckles in rear and two snap fasteners at top
- Protects instep and ankle, prevents sparks and molten metal from rolling down inside shoe tops
- If spring clip is desired instead of steel stays, ask for AO Spat 7X129

American Optical
SAFETY PRODUCTS DIVISION

The SAFETY ZONE

Keep your workers in the Safety Zone with AO Safety Equipment

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

gun for lower welding costs!

Fast production of high quality welds in aluminum, bronze, copper, nickel, stainless steel and the other "hard-to-weld" materials . . . that's the money-saving secret of the Aircomatic® process!

Lower costs through speed . . . With Aircomatic, these advantages add up to a tidy time-saving on every joint: high deposition rate . . . lower weld metal requirements because of the improved joint designs made possible . . . *and* a sizeable reduction in the cleaning time provided by Aircomatic's "no-slag" characteristic.

Lower costs through quality . . . Welds made with Aircomatic are unmatched for strength, fusion, appearance and freedom from cracking and porosity . . . because Aircomatic controls penetration and dilution . . . because high current densities and concentrated heat reduce distortion to a minimum.

This inert-gas-shielded metal arc process can be used with manual guns like the 500-amp. Model 20 shown above, or automatic equipment. Upkeep and wire costs are low. Write today for the Aircomatic Catalog, and list of recently lowered wire prices.

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AND DEALERS IN
MOST PRINCIPAL CITIES

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at the frontiers of progress you'll find

AN AIR REDUCTION PRODUCT

Seven 900-foot conveyor belts at the Steers Sand & Gravel Corp., Northport, L. I., carry approximately 7,000 cubic yards of sand daily from the pits to the screening house. The rollers for the return belt are subject to wear and corrosion but are economically resurfaced with Ni-Rod "55" for long service life.

This belt moves enough sand daily to fill a mile of coal cars

. . . with the help of Ni-Rod "55"

The Steers Sand & Gravel Corporation of Northport, Long Island, moves a lot of sand daily — 7,000 cubic yards, enough to fill a line of 50-ton coal cars stretching more than a mile.

And it takes seven long conveyor belts to bring all this sand up from the pits to the screening house.

Keeping these conveyors rolling is a continual fight against two things — abrasion from sand that sifts into the belt rollers and corrosion from salt air that blows in from Long Island Sound and eats away the rollers.

And each new roller costs $1.42, plus $10.00 in machining — an expensive replacement job over a year's time.

But Steers' welding specialists found that by using two pounds of 5/32" Ni-Rod "55" they could resurface two rollers and turn them down on a lathe at a total cost of only $4.70!

What's more, these resurfaced rollers last as long as the original rollers.

Steers estimates that they use at least 200 pounds of Ni-Rod "55" a year which makes possible a saving of over $700.

Like Steers, you'll find Ni-Rod "55" will give you sound, machinable, crack-free, non-porous welds in cast iron, Ductile Iron, Ni-Resist®, special alloy irons and when welding cast iron to steel. Usually Ni-Rod "55" can be used without pre-heating or post-heating. And it provides a stable-arc with a minimum of spatter to give a smooth bead contour.

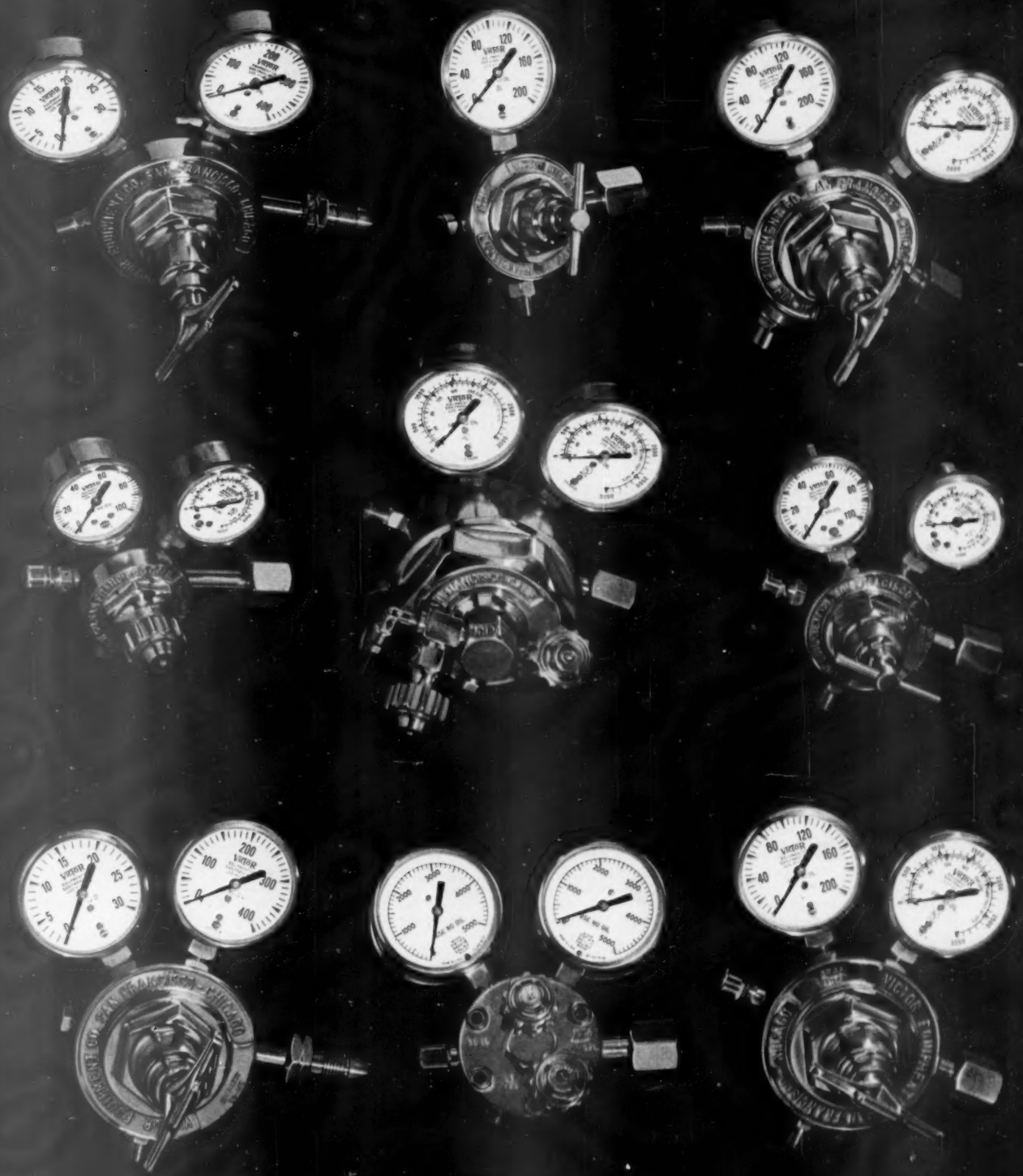
Consult your distributor of Ni-Rod "55" electrodes for the latest information on deliveries. Remember, too — it always helps to anticipate your requirements well in advance. If you have a special cast iron welding problem, it will pay you to call on him for help. And be sure to ask him for the new Ni-Rod "55" folder.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

INCO

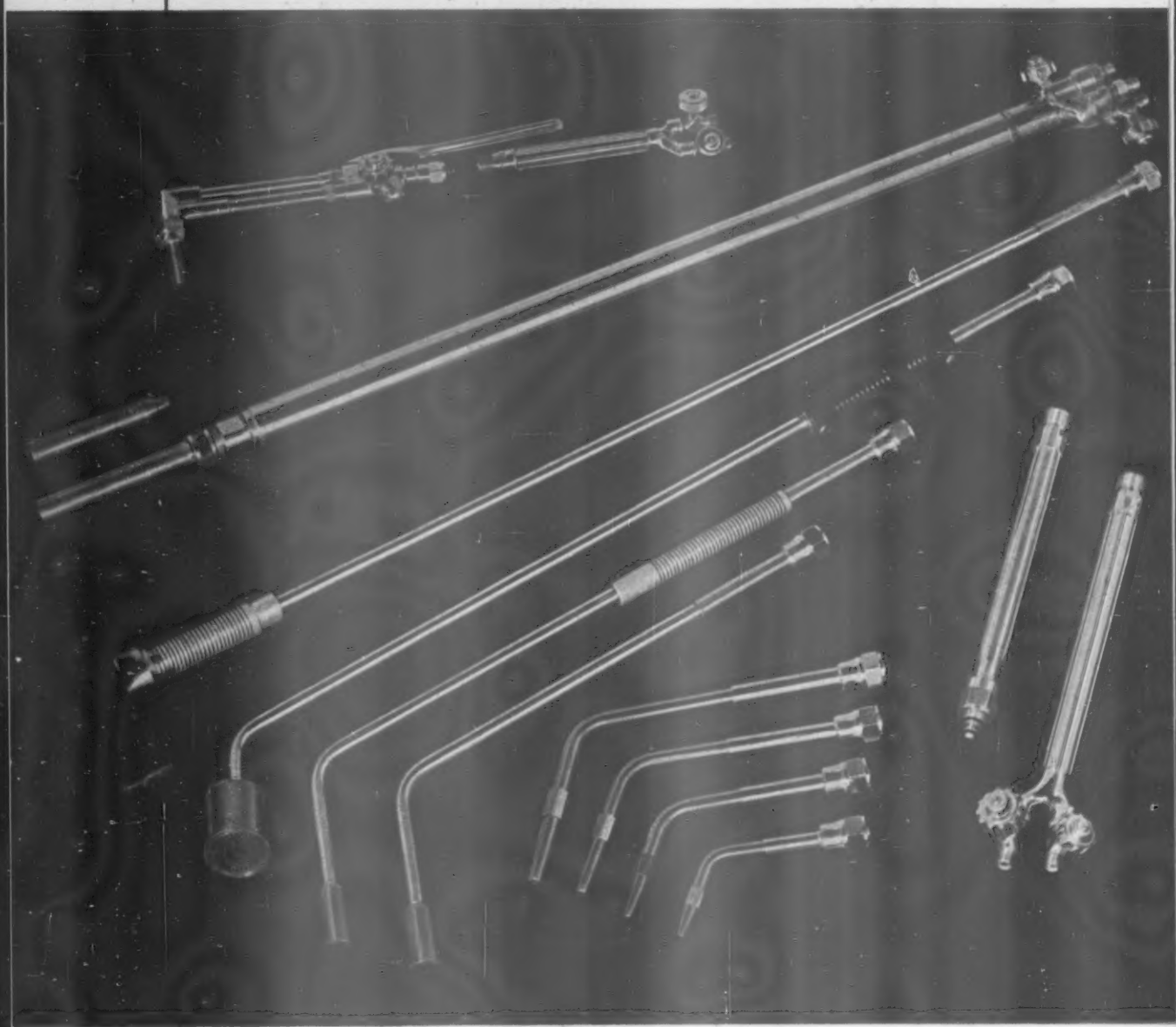
VICTOR REGULATORS

For accurate and dependable pressure control



VICTOR Welding and Cutting Apparatus

precision-built for lasting service



TOP TO BOTTOM: *VICTOR 100 series welding torch butt and C 1450-100 cutting attachment. 4000 series machine cutting torch. Stainless steel model 362 descaling attachment and preheating nozzles stay cool longer. Type 3 welding nozzles and 320 torch extension for 300 series welding torch butts (lower right). No wrench needed to change attachments.*

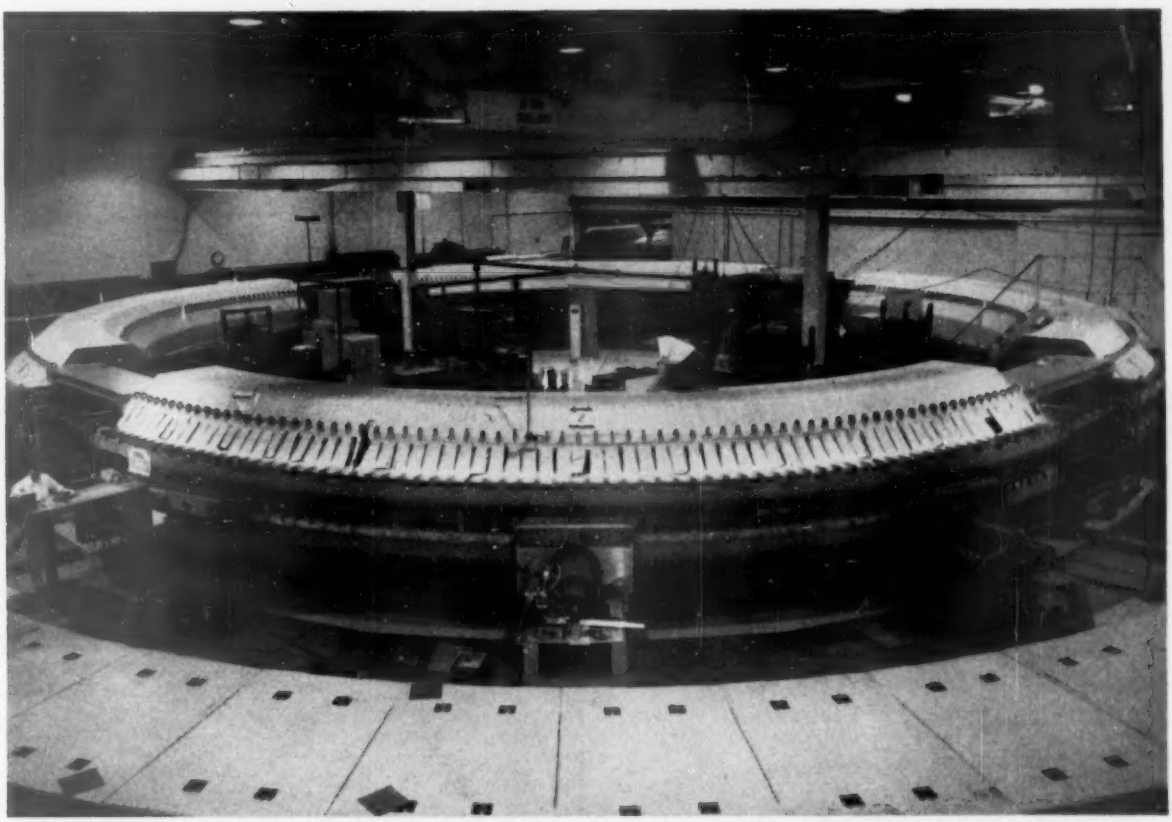
IT PAYS TO STANDARDIZE ON VICTOR Complete selection enables you to get exactly what you need for cutting, welding, scarfing, descaling, hard surfacing and other jobs. Every item precision-built to perform safely, dependably, economically. Your VICTOR dealer will gladly show you why it costs less to own and operate VICTOR!

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods; blasting nozzles.

3821 Santa Fe Ave. LOS ANGELES 58 | 844 Folsom Street SAN FRANCISCO 7 | 1312 W. Lake St. CHICAGO 7



One of principal elements in Cosmotron is huge magnet, consisting of 288 octagonal blocks, flame-cut and welded by Bethlehem. Wall in foreground, made up of concrete blocks, protects personnel from high-energy nuclear particles when machine is in operation.

Welded Steel Blocks Used in Building Largest Atom Accelerator

This is the world's largest atom accelerator. It is called the Cosmotron, and it is located at the Atomic Energy Commission's Brookhaven National Laboratory, at Upton, N. Y.

The Cosmotron makes available bombarding particles of hydrogen with an energy of from 2 to 3 billion electron volts, to create new particles known to science as mesons.

An important component of the Cosmotron is the huge electromagnet, about 75 ft in outside diameter, and weighing 2200 tons. It is designed to whirl the atomic particles around its periphery about 3 million times a second.

The magnet is a circular assembly consisting of 288 octagonal blocks. These blocks are made up of 12 octagonal plates, each ½ in. thick, and separated by insulating fibre. In rectangular slots, flame-cut in these plates, rests the vacuum chamber through which the atomic particles are whirled.

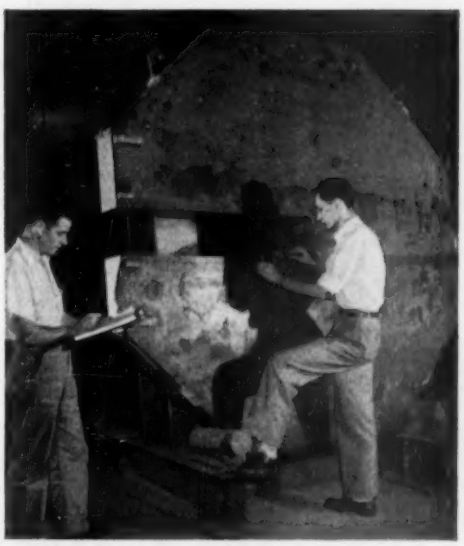
The blocks were made in Bethlehem's Weldments Shop, at Bethlehem, Pa., and shipped to Brookhaven, where Bethlehem engineers assembled them to form the complete magnet.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM WELDMENTS



Octagonal block for Cosmotron undergoing inspection in Bethlehem's Weldments Shop.

you helped design this New...

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SELENIUM RECTIFIER
TYPE D. C. WELDER

The only complete rectifier type welder—the finest offered to industries today . . . it's the welder designed specifically for your requirements because it has the features you told us you wanted in an S.R. welder.

It has ALL these features that you demanded in an S.R. welder

- The widest possible current range for extreme versatility!
- The best D.C. current for maximum electrode deposition rate!
- Easy to operate current range selector switch!
- Simple polarity reversal switch!
- Extreme arc flexibility that pleases all operators!
- High electrical efficiency for most economical operation!
- Fully guaranteed, larger, time tested rectifier stacks—designed especially for welding applications!

Plus more in the new MILLER S.R. welder.

Why not get the complete story now?
Write for it today — or see your MILLER distributor.

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SINCE 1929 • APPLETON • WISCONSIN

ESTABLISHED 1916

THE WELDING ENGINEER

NOVEMBER, 1953

Give Thanks for Our Discontent

SQUABBLES in the United Nations, the apparent hopelessness of reaching any agreement on the Korean mess, threats of atomic bombs (nuclear as well as fission), the draft, continued inflation, no reduction in the national debt, oppressive taxes . . . these are some of the things that cast long shadows over Thanksgiving of 1953. We may well wonder if we have anything at all to be thankful for.

Even in our discontent, however, we can give thanks for the fact that we live in a country where it is not a crime to be discontented. Moreover, we can talk about the cause of our discontent—or even write articles about it—and nothing will happen to us unless we should happen to run afoul of the libel laws. This freedom of personal expression is fast becoming a rare privilege. Comparatively few of the inhabitants of this troubled planet possess it today.

Much of our discontent is foolish, for it is based on comparing our goods, our properties, our incomes with those of our neighbors—the "keeping up with the Joneses" that has become so unfortunate a characteristic of present-day American life. To sit on the wailing wall and bemoan the fact that we are not so well off as Mr. and Mrs. Jones will get us nowhere if we don't do something about it.

An apt bit of wisdom along these lines was found in Elbert Hubbard's *Scrapbook*. Hubbard attributed it to Gordon Graham, about whom nothing but the name is known. Said Mr. Graham:

"There are two kinds of discontent in the world: the discontent that works, and the discontent that wrings its hands. The first gets what it wants, and the second loses what it had. There is no cure for the first but success, and there is no cure at all for the second."

CONSTRUCTIVE discontent has resulted in most of the advances mankind has known from the time when a species of hairy ape first decided to come down from the trees and live in caves. Welding, for instance, probably came into being because someone was dissatisfied with pinning pieces of metal together as previously pieces of wood had been pinned. Instead this innovator—probably the village blacksmith—heated the two bits of metal in his forge and hammered the red-hot pieces into a single piece on his anvil.

Other constructive discontent has led to improved welding processes. It is difficult to find any invention, in fact, that has not been improved because someone grew unhappy over an earlier version. The blacksmith's forge gave way to the oxyacetylene torch as a heat source, later to the welding generator and the resistance welder. Still some were discontented, and they invented the inert-gas welding processes. Even today there are discontented souls in the welding industry. Who knows to what they may give birth next day or next month or next year?

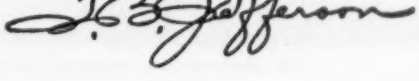
IF CONDITIONS were as they ought to be, with everything serene and simple, there might be little need for a Thanksgiving Day. At this time of year, we should stop and reflect on how Thanksgiving Day came into being. In the words of one of the Pilgrims:

"We crossed the wide and perilous sea for liberty of conscience, and here we have found it. We left the old home to gain release from persecution, and here we are free. Everything we sought, we have. It is time for thanks and not for doleful complaint."

In this fashion, the Pilgrim Fathers set aside a special day to give thanks—Thanksgiving Day. Those who are prone to think that Thanksgiving Day has no meaning unless everything in the world is rosy should remember this:

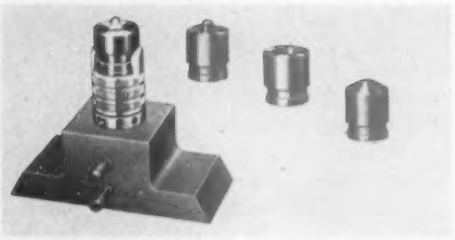
Thanksgiving Day was the aftermath of tragedies, trials and tribulations. And these three T's very often constitute the miry soil from which many of our most splendid blossoms have sprung.

Perhaps the present will be no exception.

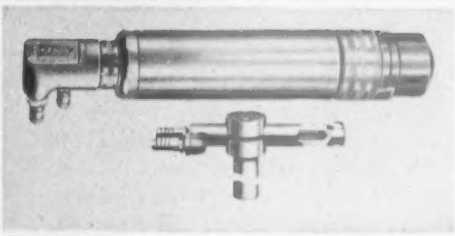


For All Your Resistance Welding Needs ...CALL MALLORY!

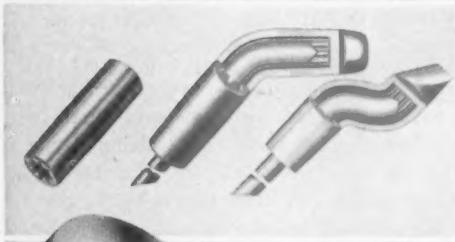
Mallory resistance welding supplies and services can meet all your requirements — whether for simple electrodes, or complicated, custom-built dies.



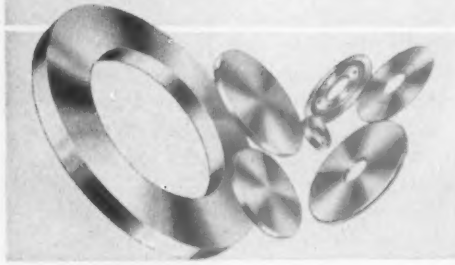
MALLORY "NU-TWIST*" DIE ADAPTORS. Now, you can change resistance welding die set-ups in a matter of seconds. By using different electrodes in the "Nu-Twist" die adaptor you can handle several resistance welding jobs with only one die set-up. A variety of electrode insert blanks is available from stock. Special shapes can be custom made.



MALLORY HOLDERS. Standard holders, available from stock, can be combined to handle practically any resistance welding job requiring extremely light pressures to over 6000 pounds. Mallory "Nu-Twist" and "Premium" holders will perform in the high pressure ranges needed for welds to meet all military specifications.



MALLORY FLUTED ELECTRODES*. Available in standard, straight, single and double bend off-set shapes, Fluted Electrodes—a Mallory exclusive—offer a 70% increase in cooling area . . . faster heat dissipation . . . positive tube centering . . . all at no extra cost. You get longer life, more uniform welds, less down time, more welds per dollar.



MALLORY SEAM WELDING WHEELS. Forged from Mallory developed alloys, these seam welding wheels are available in sizes to meet all machine requirements. They are machined to exacting tolerances . . . cast and forged under rigid controls. You get stronger, more consistent welds . . . fewer interruptions for dressing.

*Trade Mark, Patent Applied For

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

RESISTANCE WELDING ELECTRODES, HOLDERS, RODS AND BARS, DIES, CASTINGS, FORGINGS, ACCESSORIES

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Electrochemical — Capacitors • Rectifiers • Mercury Batteries
Metallurgical — Contacts • Special Metals and Ceramics • Welding Materials

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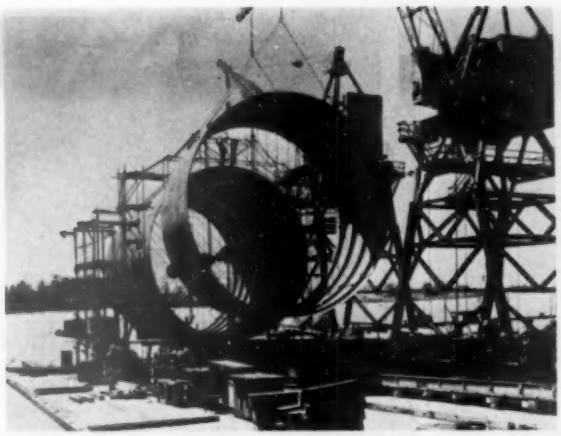
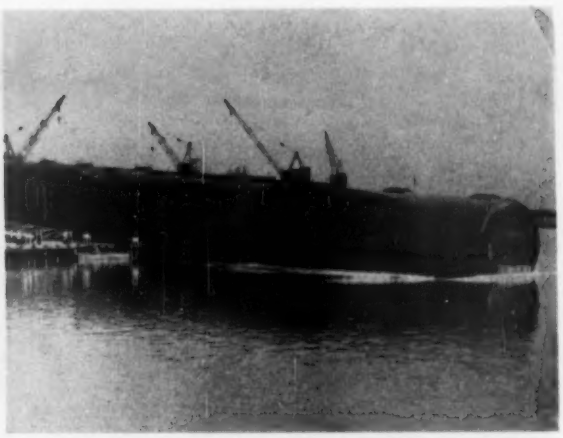
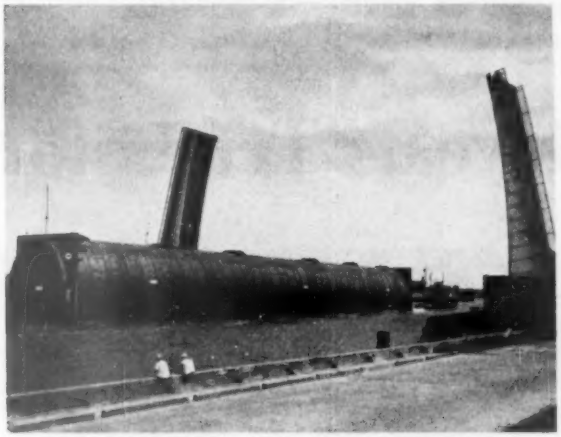
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



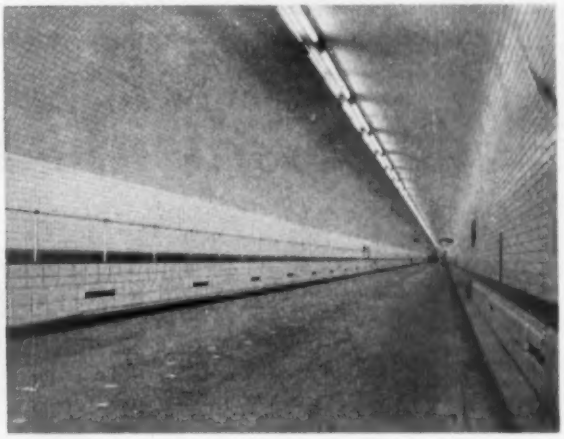
HERE's the start of a 300-ft tubular section of a highway tunnel liner. Assembly is done on a shipway



WELDED tube is bulkheaded watertight at both ends and launched head-on into river to begin its journey



SPANS of the bridge at Port Arthur, Texas, go up as the liner section is pulled along toward Baytown



HIGHWAY runs through a tube of steel half a mile long and nearly 100 ft under the Houston Ship Channel

From Steel Plant to Texas Tunnel

BY CLYDE B. CLASON

HOUSING a 22-ft roadway that runs almost 100 ft under the floor of the Houston Ship Channel, the Baytown-La Porte highway tunnel was officially opened to traffic on Sept. 22. It is expected to carry as many as 10,000 vehicles a day.

The two-lane roadway is contained inside a steel shell 35 ft in diameter and half a mile long. Sections of this colossal steel tube were welded together at the Orange, Tex., plant of United States Steel's Consolidated Western Steel Division and floated to the tunnel site 125 water miles away. There were nine sections, ranging in length from 256 to 301 ft. Component rings were first fabricated on the ground, then lifted by crane to a shipway, where the rings were welded into each giant tube.

Altogether, more than 8,500,000 lb of steel went into this tunnel liner. Workmen at Consolidated Western laid out the steel plates for the first section on March 15, 1950, and completed the ninth section seven months later. The sections were sealed watertight with bulkheads at both ends and launched into the Sabine River. Two small tugs then towed each section barge fashion down the coastal waterways to Baytown, one tug in front doing the actual towing, and the second trailing at the end of draglines to keep the tube on a straight course.

Round-shaped liners have been used in tunnels before, but the floating of a liner of this size and shape was never before attempted. The 300-ft sections were launched like ships head-on into the river. Ordinarily, a side launching would have been in order, but Consolidated engineers calculated that the head-on method would withstand the stresses involved and also whip the hazard of buckling.

Each of the nine welded tubes made its one-way water journey without trouble, traveling the distance from plant to job site in two days.

FRACTURES progressed in the plating without any relation to welds

HATCH and coaming only two feet removed from penetration were undamaged

Collision Reveals True Story

BY T. D. BEERY
Ingalls Shipbuilding Corp.
AND LaMOTTE GROVER
Air Reduction Sales Co.

THE brutal encounter of two ships at sea can tell a great deal about the strength of the materials, the effectiveness of the tools and techniques employed in construction and the quality of the skill and craftsmanship. Consider, the S. S. *Loide Panama.*

This 7,500-ton welded freighter, 442 ft long and 59 ft in beam, was built by the Ingalls Shipbuilding Corp. at its Pascagoula, Miss., yard. She was rammed by an oil tanker off Barnegat City, N. J., and hit on her starboard side aft of the deck house.

Was Hit Hard

A V-shaped-cut was made in the ship at the point of collision. The penetration was approximately 25 ft into the hull at the deepest point. The No. 4 starboard hold or deep tank flooded, as did the No. 5A starboard deep tank. The shaft alley was punctured and flooded. However, the damage was almost entirely localized within the V-shaped cut.

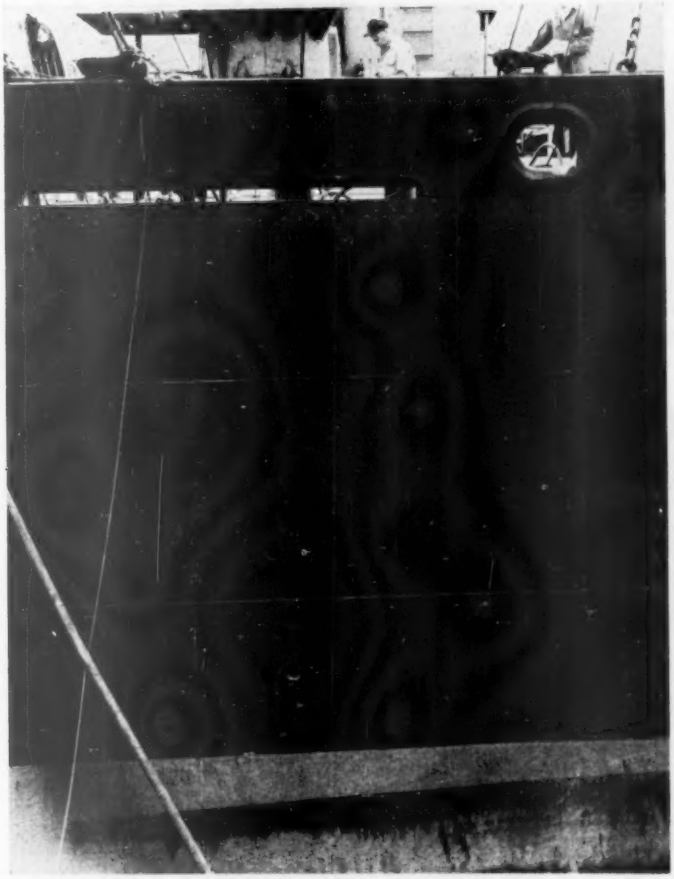
The deck plating had been forced upward and was folded back upon itself in a sharp U-bend of 180 degrees. The fractures progressed in the $\frac{7}{8}$-in. plating without relation to the welded joints. Both manually and automatically welded deck butts followed the bend without any sign of fracture. Longitudinal bending of a welded joint in this manner constitutes a most severe test. The side plating that was forced into the "V" was folded into

STARBOARD: overall view of caved-in hull aft of the deck house

SIDE plating in the collision path was folded up into sharp accordion pleats

WELDS followed the longitudinal bend of plating without fracturing

# of Welded Ship Construction



PORT: same location aft of deck house, showing welded structure

a series of sharp accordion pleats. This did not cause any cracking of welded seams.

The welded kingpost, almost at the apex of the V-shaped penetration, showed no sign of damage. Neither was there any apparent damage to the hatches or their coamings even though the penetration extended to within about 2 ft of the starboard hatch coaming.

Riveted Seams Parted

The only joints or seams that parted were those of the gunwale bar, where the deck plating was joined to the side shell plating. These were riveted seams. The heads of these rivets in way of the damage popped off, and rivets were loosened some distance farther. The bulwark was torn from its supporting brackets for a distance of several feet forward and aft of the damaged area.

Analysis of this accident establishes forcibly that *a suitably designed and built welded structure is superior to a riveted structure.* In this particular case, the damage was highly localized, which in all probability prevented the loss of the ship.

In the opinion of engineers experienced in the investigation of the behavior of both welded and riveted ships, the damage from the terrific impact of the collision would have been less localized if the *Loide Panama* had been a riveted ship. Riveted seams would have opened up in adjacent parts of the plating. It is probable that in this case the engine room and the No. 5B deep tank would both have been flooded, resulting in the complete loss of the ship.

1—BETWEEN hands of Harry Faris, welding foreman, is 7-in. spacer that will widen rear wheel of tractor

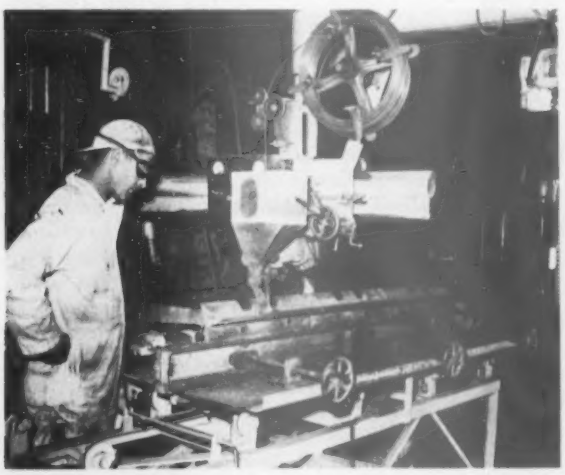
2—TRACTOR after wheel widening. Slab welded below transmission case is 5 in. thick and weighs 6,348 lb

5—TRANSPORT arm (upper) is bolted to front apron arm (below) to pull back front apron during traveling

Tailor for Tractors

The 28-year-old Shepherd Tractor & Equipment Co., Los Angeles, is primarily a distributor for tractor equipment and farm machinery. A very important side line, however, is the modification and repair of heavy earthmoving equipment.

BY FRED M. BURT



6—600-AMP submerged-arc head welds grouser stock to track pads at speed of 10 ipm. Note the work table

7—ASSEMBLING all-welded ripper on a crawler-type tractor. Ripper shanks fit into holes of bar in front

3—SLAB counterweight was flame-cut to size in the outdoor working area of Shepherd Tractor & Equipment

4—WELDING on clips to encase air hose for ejector stop mechanism; note 2-in. channel on arm at right

ABOUT half of the 80,000-sq-ft area under roof at the Shepherd Tractor & Equipment Co., Los Angeles, is used for the overhauling and modifications of tractors and other heavy earthmoving equipment. This by no means tells the story. Most of this work is done out-of-doors, in a paved yard at the rear of the Shepherd plant.

To meet specific applications in earthmoving and allied operations, Shepherd modifies many units of stock equipment after its own designs. This program adds up to a lot of work for the ten-man welding department. Welding, flame-cutting, hardfacing, build-up of worn surfaces, chipping, grinding, etc. are operations that must be done constantly.

Widening Tractor Wheels

For our first example, a large rubber-tired tractor was having trouble in pulling very heavy sheep's-foot rollers. The diagnosis: greater traction was needed. The rear tires, big as they were (24 by 29 in.), had to be replaced by tires that were even wider to increase the area of ground-gripping contact.

First, the huge tires were removed from the rims. The rim of each tire was split with a torch cut so that there were two rings instead of one. Then the rim was widened by tack welding a 7-in. spacer (photo 1) between the two halves. After the spacer had been tacked in place, the widened rim was turned on a mandrel for submerged-arc finish welding. Both internal and external passes were made on each side of the spacer.

The new tires were put on the rims and filled 90% full with calcium choride in water (a non-freezing mixture). They were then inflated to 30 psi air pressure.

Another modification made on the same tractor was to add about six tons of counterweights (including the extra weight of the new tires). A flame-cut steel slab weighing over three tons was suspended under the transmission case (photo 2). This slab carries a welded steel box that holds about a ton of iron punchings. The slab itself (foreground of photo 3) is 5 in. thick and was flame-cut to 44 by 102 in. from a mill size steel slab of 5 by 84 by 144 in. Nice little task to slice up steel of this thickness!

Similarly, other tractors are counterweighted for service as bulldozers. In this case, the added weight runs upwards of eight tons and includes a structural frame to hold the 'dozer blade.

Other tailored alterations are continually in process in the outdoor yard. The weldor on the left of photo 3 is chipping a flame-cut plate for sideboard extension of a scraper. In the background another such plate is being ground with a pneumatic cup grinder.

Ejector Stop

Another Shepherd innovation is an automatic ejector stop. When a scraper is ready to discharge a load of earth, the operator pulls a cable to raise the front apron. The Shepherd improvement is an air-operated stop mechanism that automatically disengages the apron cable control when ejection is complete. This greatly simplifies the work of the scraper operator.

The device consists primarily of a roto-chamber, air hose, valve assembly, fittings and clamps. Installation involves considerable arc welding. The weldor in photo 4 is welding on clips to encase the air hose; other welds on the draft tube arm at right were made to attach the 2-in. hose channel. The man at the top of the scraper is installing the hose and valve assembly. Shepherd also manufactures a similar device to control bowl lift.

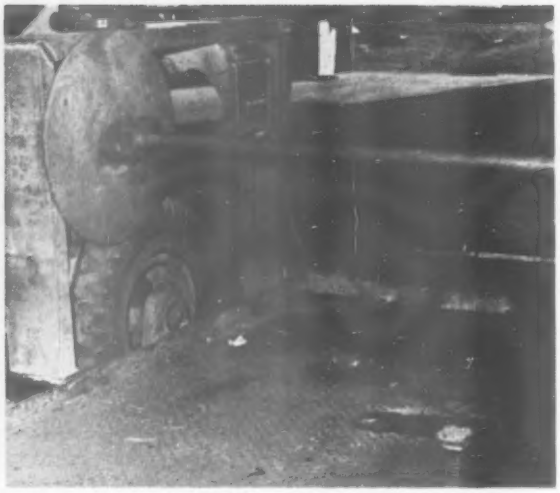
Better Weight Distribution

When the scraper is empty, it has a weight distribution that exceeds the maximum single-axle weight allowed on some highways. To meet such highway regulations, some of the weight must be shifted to the rear. This sounds impossible, but it can be done by adding welded arms on each side for transport purposes. These arms are bolted to the arms of the front apron (using a cable and pull block rigging). The transport arms swing the scraper apron up over and back to rest on a special fixture (welded up from angles) that is clamped to the push beam at the rear. The shift transfers a little over a ton of weight from front to rear axle.

The all-welded transport arm is

(Continued on page 54)

1—UNDERGROUND belt reel cures some headaches of continuous mining. Bill Manning checks a measurement



2—LEFT flange of belt reel is at upper left. Just in front of flange is bracket for mounting 5-hp motor

Welding Goes Underground . . .

Dreaming up new machines for coal mines keeps Bill Manning and Henry Stephenson constantly on their toes. It's a fine life, they say—even with the headaches.

BY DAVID LEWIS

Welding Engineer,
The Lincoln Electric Co.

THE Manson Machine Co., Taylorville, Ill., was founded five years ago by William Manning and Henry Stephenson to furnish welding and machine service to local coal mine operators. The "Man" in the company name comes, as you may have guessed, from Manning and the "son" from Stephenson. Before they started in on their own, Manning and Stephenson were both employed in the mines as mechanics and electricians. This background has proved invaluable in helping them to design and build new machinery for coal mining.

"Mine operators continually want and need something which no manufacturer has yet made," says Bill Manning. "Between our shop and the mining engineers, we've been able to make almost every kind of machine needed. This fortunate situation keeps the shop full of work and all of us on our toes for new ideas."

The big interest in coal mines right now is the new system of continuous mining. Briefly, this consists of cutting the coal at the face and running it out on the ground on endless belts. Some of the belts are comparatively short, and they deliver to other belts, which may be hundreds of feet or even a mile long. In some cases a shuttle car delivers its load received from a loading machine at the face to a nearby belt running from mine bottom to side. Since some of the mines are as deep as 350 ft measured vertically, the length and capacity of belts which must run from top to bottom in specially driven inclined shafts can be imagined.

This system is in its infancy in coal mining and is constantly being improved as the squeeze for manpower increases. Like innovations in all industries, the continuous mining method has brought in a new set of troubles to replace the ones it has cured. The handling of belts in a belt-operated mine is a real problem —most methods require too much time and too much labor.

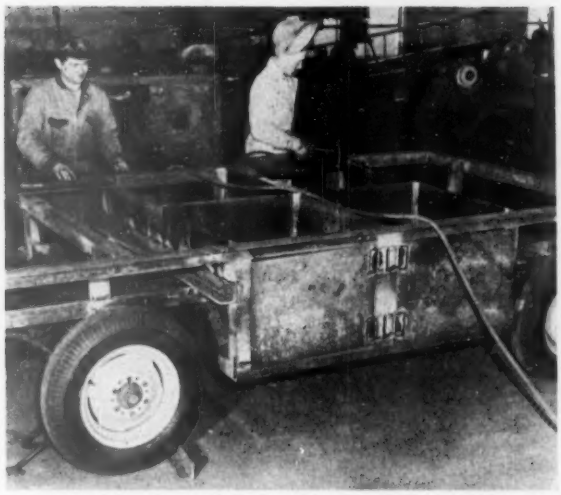
The efficient answer is under construction in the Manson shop. It is a power-operated machine on a trailer and it will wind or unwind belts, transport them and store replacements. This belt machine is for underground operation, and the welded frame is mounted on two 7.50 by 15 tires mounted on truck wheels (photo 1). The motorized steel reel will handle belts up to 48 in. wide and will wind a spool of any kind of conveyor belt up to 5 ft in diameter.

The left flange of the belt reel is shown at upper left of photo 2. The reel is directly connected to a 5-hp direct-current motor through a gear-reduction assembly consisting of a worm gear and pinion. The motor is controlled by a conventional hand operated controller, and the operator can "inch" belts in either direction or let them "roll."

The need for such a machine is particularly concerned with belts that must be moved as the diggers follow the seam of coal. Automatic belt mining can send coal from the bottom to top at the rate of 2½ tons per minute, so you can see that the forward conveyor belts must always be on the move.

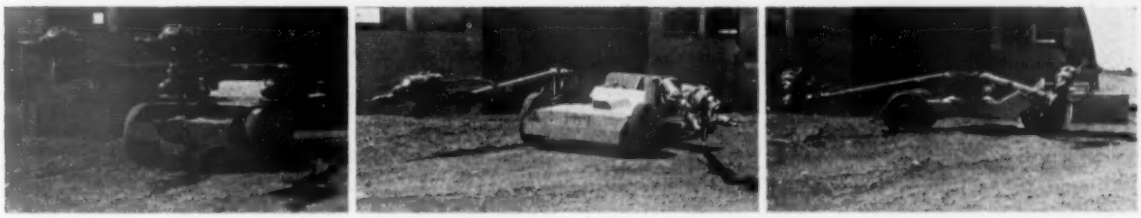
UNDERGROUND WORK SHOP

Photo 3 shows another unusual machine under construction in the



3—PORTABLE shop car allows an underground mechanic to set up shop as close to the work as possible

4—MOUNTED on a single crawler tread, this original machine was built to recover abandoned equipment



5—TRAILER and tandem mountings for two coal mine drills. The three photos show maneuverability of the mountings

Manson shop. This is a portable shop for use by underground mechanics. The mechanic's shop is on a four-wheel trailer, the top of which will be his workbench. The trailer has bins and compartments to store parts, bolts, nuts, hand and power tools such as power drills and grinders. When the mechanic moves this shop, he takes everything with him and is ready to go to work when he plugs in his power cord and turns on the bench lights. This time-saving contraption may rank in coal-mine history with the convenience of a shirt with a pocket.

Buck Rogers "Crawdad"

Another problem was how to reclaim steel and equipment left behind when mining operations had been abandoned. Without using an army of men. "We built a machine," said Manning, "with which two men can yank out the foundation of Radio Center in a couple of minutes."

Manning calls this device a recovery machine. No other machine was ever more aptly named because it can and does recover. This original machine looks like something out of Buck Rogers (photo 4), but it is fast and efficient underground. It consists of a welded steel frame mounted on a single crawler tread in the center, powered with an electric motor. A reduction gear and drive connect the motor to a large, heavy-duty winch. The drum of the winch is wound with heavy wire cable. The power can be switched from tread to winch, or winch and tread can be operated at the same time. The "crawdad" can back out with a railroad track and be reeling it in at the same time.

In operation, the machine is driven through tunnels to the equipment that is to be removed. One man takes the cable and goes up the passage to hook it on. The machine reels it in and then tows it to the pit bottom area to be loaded out or to another area below ground for reuse.

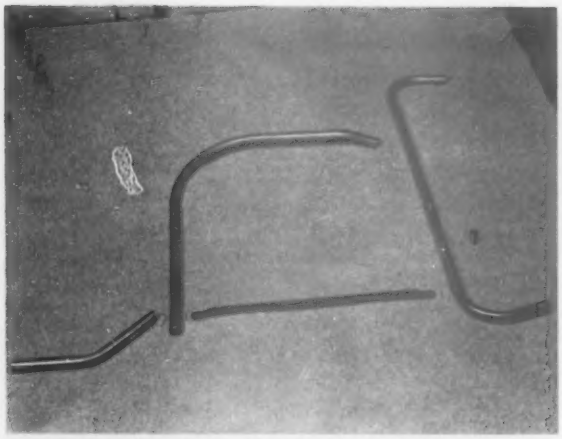
Tandem-Mounted Drills

Another job recently completed in the Manson shop was to make a trailer and mounting arms for two tandem-mounted drills (photo 5). The drills can be swiveled to face in any direction. This equipment made it possible for the mining company to increase the footage of blast holes.

When manufactured steel bases were rare, Manson was building them for the 300 and 400 kw direct-current motor-generator sets commonly used in the coal mines. Motor generator sets are skidded around a lot in the mine passages, and the welded steel base withstands the rough treatment better than the old cast-iron base.

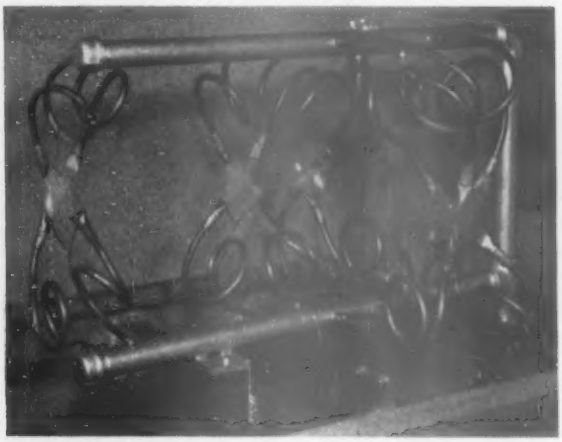
Manson Machine Co. deserves extra kudos for its welded steel bases because it has no planer to finish off the top surfaces. Most manufacturers weld such bases up to loose tolerance. After the steel has cooled and done all the twisting it wants to do, they put the base in a big machine planer and take a cut off the top to level it. Not having any planer, Manson Machine Co. has to make its bases true in the first place, which means allowing for stress and warpage.

If you want to be in an interesting business where every assignment is unusual, where nothing is ever the same, you should try for a job with the Manson Machine Co.

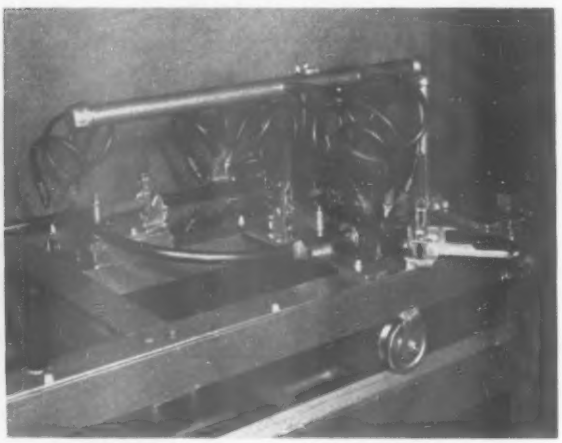


1—PARTS to be brazed and the silver-alloy inserts

2—ASSEMBLING and clamping is done in this fixture



5—HEAT pattern for joints was carefully calculated



6—WHEN alloy flows, heat is shut off automatically

Production Went from 9

BY JOHN S. LENTZ
Boyd Welding Co., Erie, Pa.

ONCE the production of tubular side frames for invalid chairs at the Erie City Mfg. Co., Erie, Pa., was nine frames per hour. Present production is 25 frames per hour. Behind the increase of 178% lies a story.

For many years, Erie City had been brazing the tubular frames with an oxyacetylene torch and high-temperature brazing alloys. Not only was production comparatively low, but the joints had to be ground after brazing to prepare them for chrome-plating.

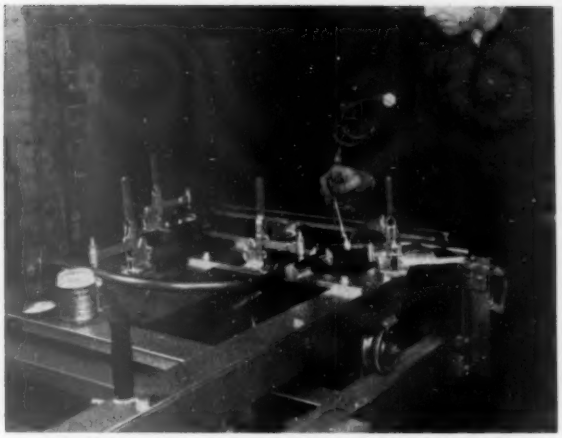
It goes without saying that consistently strong joints are essential to a product of this kind. With the joint strength established, the next question was to better the production rate. The problem was laid in the hands of the Boyd Welding Co., local distributor of silver-brazing alloys. After a detailed study of both production and quality requirements, Boyd came up with a machine having a two-fixtured carriage. The carriage is pushed back and forth along a track to bring the fixtures under heating stations at each end of the machine.

Instead of oxygen and acetylene, a mixture of city gas and air is now employed for heating. All five of the joints required in each side frame are brazed at once. Furthermore, the heating period is timed and cut off automatically at the end of 85 seconds. While one of the side frames is being heated, another frame is being assembled in the second fixture. With 25-frame-per-hour production, 24½ minutes non-heating time out of each hour is available for shifting the carriage from one station to the other.

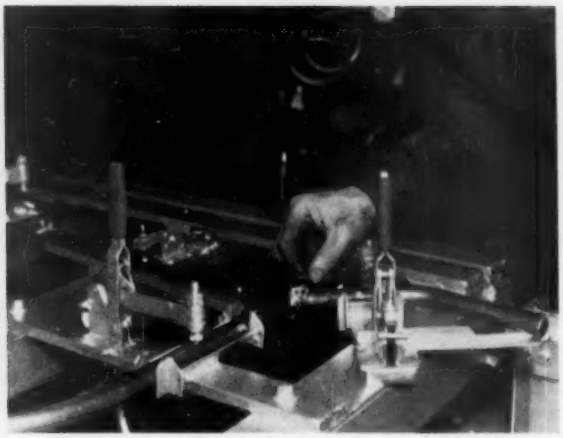
A single operator can handle the whole thing.

Silver-Alloy Inserts

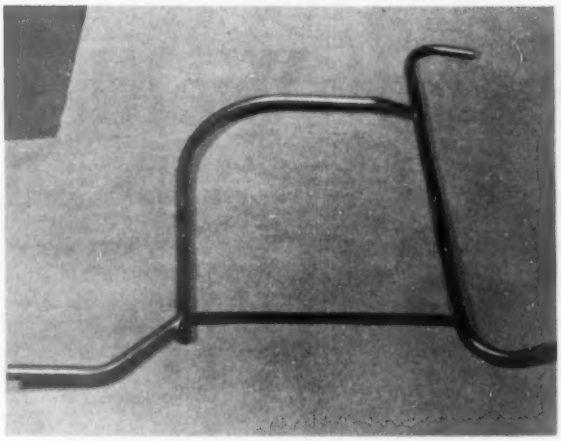
The brazing inserts include: (1) rings and (2) straight and bent pieces of wire. Both types are shown in photo 1. The rings are formed of 1/16-in. wire of an alloy of 45% silver, 15% copper, 16% zinc and 24% cadmium. The melting point of this alloy is 1,145 F. The straight and bent pieces are also 1/16-in. wire, of an alloy 35% silver, 26% copper, 21% zinc and 18% cadmium. This alloy is free-flowing at 1,295 F.



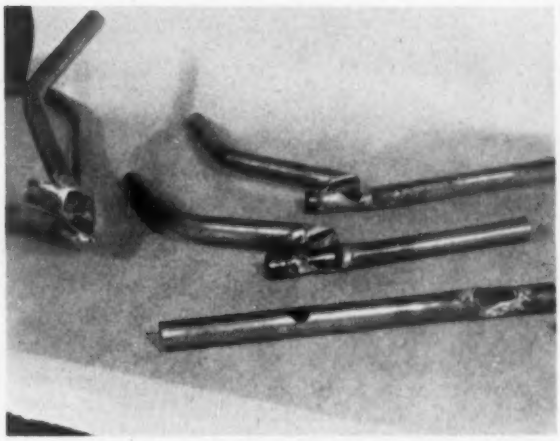
3—OPERATOR fluxes the five joints and then. . . .



4—PREPLACES the silver-alloy inserts (see photo 1)



7—FINISHED side frames come out looking like this



8—TESTS show strength of the silver-brazed joints

to 25 Frames per Hour

The parts come to the brazing operator degreased and ready for assembly. Photo 1 shows them laid out in their relative positions. The tubing is $\frac{7}{8}$ in. in diameter. The steel strip is $\frac{3}{4}$ in. wide by 3/16 in. thick.

The parts are assembled in the holding fixture (photo 2) and clamped firmly with toggle clamps. The spring plunger at right foreground of photo 2 keeps the proper tension on the adjacent joint. When all the clamps are down, the joints are fluxed (photo 3), and then the silver-alloy inserts are placed (photo 4). This completes the loading of the fixture.

Since the five joints are brazed at once, on an automatically timed cycle, it is necessary to bring all joints to brazing temperature at the same time. The heating pattern has been very carefully worked out (photo 5). The burners face from four directions to assure uniform heating throughout the area of each joint. The carriage is rolled under the burners, and in 85 seconds the joints turn a uniform dull red. When the preplaced brazing alloy flows (photo 6), the gas flow is cut off by an automatic timer. Pilot lights are left burning, however, to relight the flames at the proper point in the next cycle.

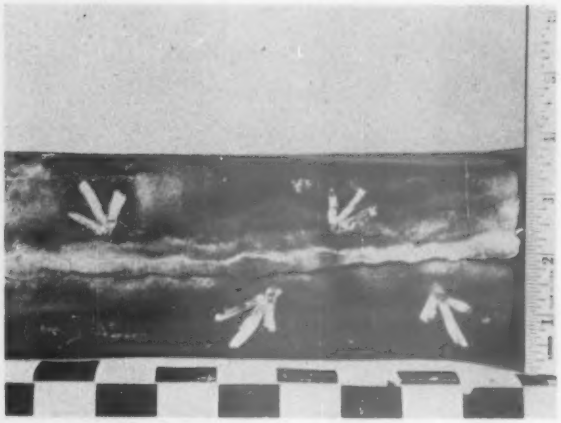
As soon as the brazing alloy has set, the holding fixture is rolled back to the loading position. This action moves the second fixture beneath the flames. The finished side frame is taken out of the first fixture and another is assembled in its place while the frame at the opposite end is being heated.

The finished side frames come from the fixtures as you see them in photo 7. After cleaning, they are ready for chromium plating. The joints show smooth fillets that do not require any grinding before plating.

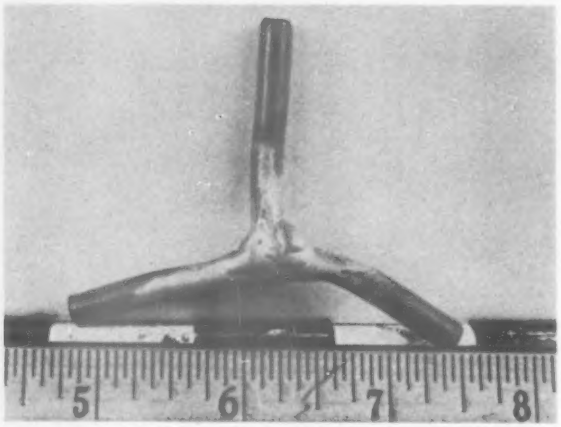
Joints Strong as Tubing

Test joints made with these silver alloys have demonstrated that the brazed joints are at least as strong as the parent metal. In the test pieces shown in photo 8, the joints could not be pulled apart. Instead, sections of the tubing wall pulled out.

This brazing machine is designed for flexibility. If desired, the heating manifolds can be changed without destroying the burner arrangement, or the fixtures can be removed and replaced with other fixtures for holding different assemblies.



1—CRUDE-looking oxyacetylene weld on an aluminum air duct 0.057 in. thick showed excellent penetration



2—BAD from the standpoint of too much brazing alloy, this Y-branch in aluminum tubing will do its job

Russian Welds—

There's lots of welding on a Mig 15. Much of it is ordinary oxyacetylene welding. The quality varies from the crudest welds to the very best workmanship.

BY HERMAN C. PHELPS

Informed United States and British metallurgists were the source of much of the material for the following article. The research has been a remarkable piece of brilliant detective work on the part of many individuals and branches of the armed services. First, a captured Mig 15 was taken apart with painstaking detail. Qualified engineers and metallurgists then went over it with a fine-tooth comb. This research was done at Wright-Patterson Air Force Base, where facilities for such an undertaking are available. Everything except the welding on the parts shown in the accompanying photographs is still classified secret. The source of the parts is unimpeachable and they were examined personally by the author.

—The Editors

SOVIET engineers show real ingenuity in their ability to assign skilled, unskilled and semiskilled labor. They also show equal skill in substituting for critical materials.

Their engineers and key personnel are astute metallurgists and know to a degree the true worth of all alloying agents and metals. They also emphasize quality where it counts. However, they are equally efficient in knowing where it does not count. Here they de-emphasize it with equal skill. They do this by rationing skilled labor (such as that required by welding) and saving critical metals. In nearly every instance this is done without interference to the performance of the part in question.

If the part to be welded demands workmanship by skilled personnel, the best weldors are assigned to the component. These same engineers show astute skill in assigning the less-skilled and the learner equally well according to his lack of ability.

More Steel on Soviet Planes

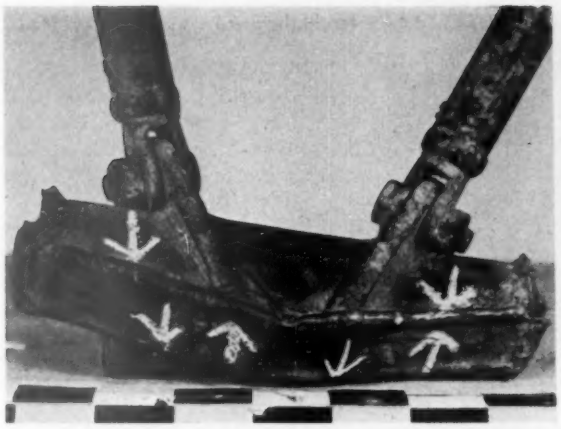
Soviet engineers substitute welding for difficult forgings and in some instances extrusions. Many times two or three individual parts will be welded together and used in place of castings, forgings or extrusions. In general, the Soviet technicians use steel parts in spots where their opposite numbers in the United States would normally turn to the light metals. This could be because Russian tooling is geared to the machining of steel more than to the light metals. This does not mean that only steel is being fabricated behind the iron curtain. Welding is used to fabricate other metals and alloys, including stainless steel, aluminum and magnesium. So far, however, no titanium has been found on Soviet equipment.

The Soviets do use a great deal of stainless steel. A very high-nickel alloy, which we call nemonic 75 and 80, is also used in jet engines. The nemonic 80 contains 75% nickel, 20% chromium and 5% of other elements. This alloy is used for such components as turbine buckets. These are fabricated by welding, but the welding method used was not dicernible to the eye. The machining is high class, what anyone would call quality workmanship.

Aluminum Is Good Grade

The Mig wings and fuselage are covered with 24ST aluminum that is as good as any found in the U.S. All sheets are flush riveted so evidently Soviet engineers have not found a way to weld 24ST with satisfactory results.

Apparently, many aluminum parts are welded by the oxyacetylene process using filler rods of 2-S pure, 5% silicon and brazing alloys. A good example of the 2-S pure filler wire was found on an air duct (photo 1). The aluminum sheet is 0.057 in., or

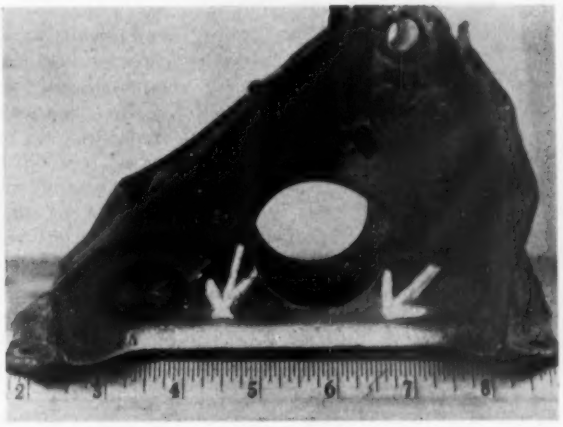


3—POOR in looks, not so bad in reality, are welds on this solid steel landing bracket (a critical part)

4—GOOD gas welds—in fact, ten of them—were found on this actuating arm, a part only 10 in. long

Good and Bad

5—EXCELLENT technique was displayed on gas welds made on this steel fitting for high-pressure air lines



6—GOOD workmanship appears on stamped sheet-metal bracket. Material is an oil-quenched low-alloy steel

slightly under 1/16 in. thick. The duct was welded by the oxyacetylene process and was quite crudely done as far as appearance goes. However, penetration (a key factor) is excellent even though the welding bead shows poor control on the part of the weldor. The part was given a dichromate anodize after welding.

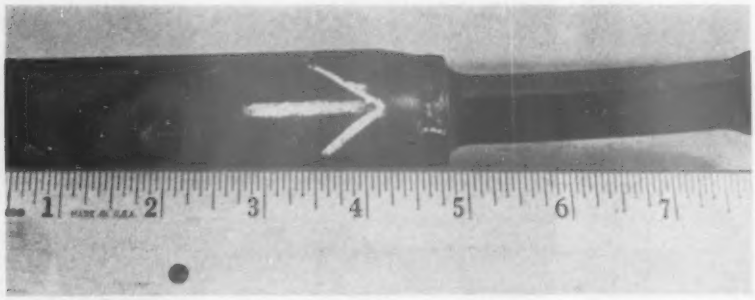
75% Gas Welded

This weld shows the results of a sound hammering delivered after it was completed. One end has a riveted strap connection for mechanical fastening to the next section. This was made from a 2-in. strip of the same material and welded at the ends. These welds were far better than the duct welds.

Everywhere parts are gas welded. Our estimate is that at least 75% of all welding on Soviet aircraft is done by this process. Possibly, there are several sound reasons for using this method. One reason may be that many parts are quite small. It may be that gas welding requires less expensive equipment and less of it, or could it be that the Soviets are short of electric power?

Whatever the reasons, the fact remains that Russian designers and engineers make more use of oxyacetylene welding than any other process. Metal-arc welding runs a poor second, with brazing and resistance welding last on the list.

Not very many resistance-welded parts were visible. One of them was an ammunition link chute adapter that was formed from stainless-steel sheet and spot welded. This adapter weighs only 6 oz. Many aircraft parts had joints of a mechanical nature in places where engineers in the United States would have specified spot, seam or projection welding. Don't wipe the Soviet slate clean on resistance welding, however. It has recently come to the attention of our military that in the land of the hammer and sickle they are successfully resistance welding three different



7—VERY poor gas welding was found on this 42-inch-long rod. Raised surfaces are caused by stops and starts necessitated by lack of jigging

thicknesses of metal simultaneously. That is something we haven't been able to do very well on this side of the Atlantic.

Aluminum brazing alloys are used on small parts. A good example is an air line of aluminum tubing (photo 2). This tubing measures 0.237 in. OD, 0.157 in. ID, 0.040 in. wall thickness. It was brazed together to form a Y-branch and shows fair workmanship, though by our standards too much alloy was used. After brazing, the part was anodized by a dichromate process.

The Russians have several types of copper-base brazing wire similar to ours. They also have silver-brazing alloys and some copies of high-nickel German brazing alloys as well as a few specialties of their own.

Submerged-Arc Welding

Even though arc welding lags behind on Soviet aircraft, the Russians are as proficient as we (in some instances superior) in the technology of submerged-arc welding processes. The Ukranian Institute of Welding has developed a semiautomatic welding machine that uses granulated flux and has automatic control of the wire feed. The current is directed from the welder through a reel of electrode wire in a manner unusual by U.S. practice. The wire is wound around the cone-shaped drum holding the flux, which drum is an integral part of the wire-feeding mechanism. From it, the electrode wire is fed through a hose to a cone-shaped hopper. The hopper is actually part of the electrode holder and has the starting buttons on it. The rate of wire feed is constant and does not vary to accommodate to arc conditions as does American equipment.

The feeding mechanism is light, portable and enables a large floor space to be served from a fixed position. The electrode holder is guided manually and can be supported entirely by the operator. The Soviets say an operator can maintain a sufficiently uniform gap (arc) to produce an excellent seam with a constant rate of wire feed. The flux, which contains a moderate amount of calcium oxide, is used in a finely granulated state. A small layer of flux effects a good isolation of the arc, which reduces flux consumption and permits welding with a minimum distance between the work and the lower edge of the hopper.

The technique of carrying the electrode wire in the hose apparatus stems from discoveries concerning the effects of automatic arc welding at high current densities with thin electrodes (0.047 to 0.0117 in.). Some of these advantages are said to be:

1. It is possible to vary the proportion of parent metal in the welded seam. Depth of penetration of the arc for the same current increases with current density. Fusion factor of the electrode wire increases two to three times.

2. Current stability is increased.

3. Thin wire reduces the consumption of electrode energy.

4. Metallurgical processes taking place during the welding cycle are favorable.

5. Less porosity or cracking results in the heated condition.

6. Concentrated application of heat, due to the high current density, reduces grain growth in the parent metal.

7. Small-diameter electrodes can be used in a twin-arc arrangement to replace a single thick electrode. It is easy to strike and maintain an arc, making the automatic drive more reliable. Physical properties of the welds produced with this equipment are high in spite of the high speed.

Some Soviet Work

Let's look at some more parts taken from Soviet aircraft. One particular part is rather baffling: a steel landing gear bracket (photo 3). This is a critical part of the Mig structure. The part is very heavy, and one piece appears to be a solid bar 1 in. square. Even though solid, however, the bar has two welds running the full length of one side on the edges; why they are there is anyone's guess. Two tubes are welded at the fork to form clevis joints, and then the ends of the heavy bar are welded to light 1/16-in. sheet. When you consider that one part is a solid 1-in. bar and the other a 1/16-in. sheet, the gas welding shows excellent workmanship.

Another Mig part has so much welding on it that it is almost ridiculous. This part (photo 4) is an actuating arm or rod, which is a unit of the control linkage. Altogether, there are ten gas welds on a part measuring 10 in. long and 1¼ in. in diameter. You guess why a casting was not used! Just to fabricate this one part must have taken a first-class weldor nearly two hours. The part shows excellent jigging and excellent welding despite the disadvantage of so much welding in a small area.

High-Pressure Fitting

A fitting for a high-pressure air line had two excellent gas welds. This part (photo 5) is a simple banjo-type fitting of low-alloy steel. The wall thickness is over ⅛ in., and the welds are about as perfect as will ever be found anywhere.

Another perfectly welded critical part is a low-alloy steel support bracket (photo 6). It is stamped from oil-quenched steel sheet and varies in thickness from 0.047 in. to 0.050 in. It is gas welded extensively and appears to have been heat treated. This part is completely fusion welded on both sides around the outer perimeter and has eight different welded connections. All phases of the welding are excellent. The back sides of the welds were not burned through but show signs of proper adhesion. The beads are positively perfect—smooth, evenly spaced and everywhere equal in width.

Such gas welding could have been done only by a master craftsman.

(Continued on page 54)

Westinghouse Electric Co. photo

1—MODEL of wind tunnel being built at "tornado town" for U. S. Air Force

Nelson Stud Welding photo

2—ALL IT takes is a trigger squeeze to end weld a ⅝-in. stud in place. Stud circle is to hold outer bearing of a 6-ft blade on stator ring

Save $100,000 at Tornado Town

MAN-MADE gales up to 2,500 miles an hour will enable the U. S. Air Force to test and evaluate supersonic planes, aircraft engines and guided missiles in the world's largest wind tunnel, now under construction at Tullahoma, Tenn.

This project at "tornado town" is known officially as the Arnold Engineering Development Center, being named after the late General "Hap" Arnold, commander of the U. S. Air Force. The transonic circuit will be finished early in 1955, while the supersonic circuit is scheduled for completion in 1957.

The man-made gales will shriek around two separate closed courses inside a huge pipe that is nearly wide enough to hold both tubes of New York City's Holland Tunnel. A 216,000-hp machine—the largest rotating machine ever made—will produce the artificial hurricanes. This machine is being built by the Westinghouse Electric Corp.

The big motors and even bigger compressors that comprise this vast machine will occupy a distance equalling the length of two football fields. The plastic model (photo 1) shows the layout. In this picture, Engineer Melvin Stevens is pointing to the motor drive building where the four motors and five compressors will be installed in tandem. The supersonic tunnel will occupy the empty space at the left.

Most of the push of this hurricane maker will be furnished by two 83,000-hp motors—the most powerful ever built by man. Each weighs 225 tons (as much as a railroad locomotive) and stands more than 21 ft high. When to this pair of giant twins is added the two 25,000-hp motors, enough power will be consumed to supply the entire city of Nashville. Just for cooling, 100,000 gallons of water per minute will be needed—enough water to meet all the requirements of a city the size of Washington, D. C.

Welding entered the picture when the five giant compressor stators were being fabricated at the Westinghouse Sunnyvale, Calif., plant. Ranging in diameter from 26 to 34 ft, these colossal bladed rings set still another record. They are the largest stud-welded assemblies ever produced.

By eliminating the drilled and tapped holes that conventional threaded studs require, the welded studs were said to effect savings of $100,000. Total material cost for the 20,000 flux-filled studs used was less than $2,000. If drilling and tapping had been required, $40,000 to $50,000 would have to be spent for the tooling *alone*.

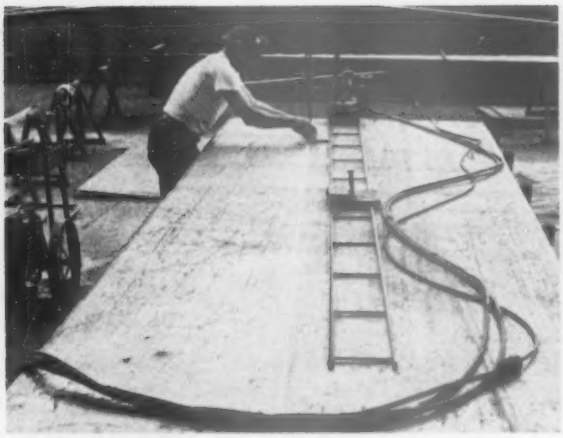
The transonic compressor has stator blades 2½ ft wide by 6 ft long, which weigh 1,000 lb each. Each of these big blades turns in an inner bearing and against an end plate or outer bearing. The outer bearing (photo 2) is mounted on the stator ring with twelve ⅝-in. studs and the inner bearing (photo 3) with eight ¾-in. studs.

In photo 2, the operator is welding on the twelve ⅝-in. studs that carry an outer bearing. The stator ring (see front cover) is 34 ft in diameter by 10 ft high and will have 88 blades, each requiring 20 studs. A simple template insures stud location to an accuracy of ± 0.015 in. All the welding equipment needed—power unit, control unit and 5-lb hand gun—is shown in photo 2.

Nelson Stud Welding photo

3—TIGHTENING a nut on ¾-in. stud to secure the inner bearing

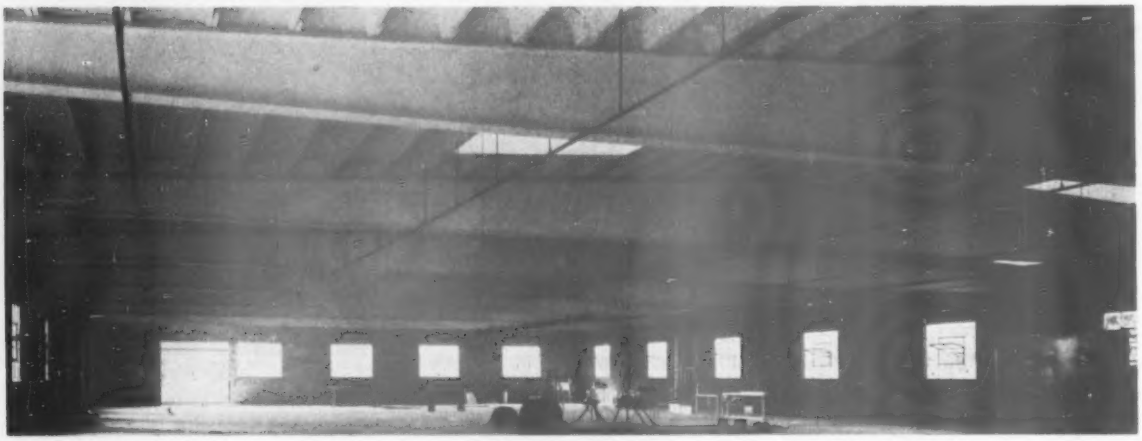
Cost of the split-second application of the two sizes of studs is only a fraction of what the long machining job would have cost if conventional threaded studs had been used. The specifications would have called for a Class 5 fit, which requires drilling, reaming, rough tapping and finish hand tapping on each stud hole. Figure it out from there.



1—FLAME-CUTTING is done by a straight-line cutting machine. No two girders are ever alike on a job

2—FLANGES are joined to the web by fillet welds, made while the girder section is in a "half-size" jig

Tapered Roof Girders



5—"PACKAGED" girders have been erected. Design, fabrication and erection are handled entirely by one company

BY JAMES JOSEPH

CONSTRUCTION men are calling the Ross-Carter Corporation's all-welded tapered steel girder "revolutionary." Whether or not that is too strong a word, this fabricated roof support does reduce weight and save steel. The girder is hand tailored to exact roof specifications, and no two are ever alike on one job.

WELDED TO ORDER

Engineeringwise, the tapered girder is made deeper vertically in the center (where the greatest loads are). By making up girders to specifications, Ross-Carter engineers can do away with excess steel.

Five men can assemble and weld a 50-ft girder in about two hours at the company's fabricating plant in North Hollywood, Calif. A necessary preliminary step is a huddle over blueprints. After this conference between the shop's welding engineers and structural engineers from the company and outside contractor, the girder designs are drawn up (designs are now somewhat standardized for various lengths and loads). When the drawings have been approved, actual fabrication can begin.

A 25-ton overhead monorail crane delivers plate steel to the cutting table, where it is marked and cut out to fit. Most cuts can be made by a straight-line cutting machine (photo 1). Usual thicknesses are 3/16 to 3/8 in. for the webs, 3/8 to 3/4 in. for the flanges. Two cutting tables are used, with two automatic cutting machines traveling on tracks.

The shop has two full-size jigs and four half-size jigs for assembly. The full jigs are 80 ft long; the half-sized ones 40 ft. If the girder is over 40 ft in length, it must be assembled as two halves, which are then welded together in the full-size jig.

In the half-size jig (photo 2), two men work on a girder simultaneously to weld the web to the flange plates. On each side, 3/16-in. fillet welds are laid from the center of the half girder to its ends. The welding is intermittent (skip welding). Welds about

3—AFTER girder halves have been welded, they are carried to a full-length jig and butt welded together

4—FINISHED girder is ready to go to site. Notice line of skip welds and how girder is deeper in center

Called "Revolutionary"

3 in. long are spaced about the same distance apart. The spacing is not constant, however. In the heavier center portion of the girder, the fillet welds joining web and flanges are more closely spaced than at the ends. This weld spacing is fairly critical and calls for considerable know-how on the part of the weldors. Continuous welding is not necessary structurally and would add greatly to the welding time. Also, the chance of distortion is avoided by skip welding.

When the halves of a big girder have been welded in separate jigs, they are picked up by a 25-ton overhead crane and carried to the full-size jig (photo 3). Here the adjoining flanges and webs are butt welded together with 3/16 and 1/4 in. electrodes. The joint is beveled if the plate is over 3/8 in. thick; otherwise no edge preparation is done.

In photo 4, we see a girder that has been butt welded and is ready for erection. Notice how much deeper this fabricated beam is at center than at the ends or "heels."

J. E. Ross heads the company's welding shop, where about 16 weldors are on the job. Welding equipment includes six a-c welders, including four 300-amp machines. Welding is done in three shifts 24 hours a day.

Erection at the Site

Girders arrive at the job site complete. Nailer and blocking holes have been accurately spaced and punched, and all bolts and connecting plates are ready for immediate erection. The average time needed to install a 50-ft girder is around 11 minutes. Since most roofs require no more than 18 girders, the company's seven-man erection crew can put up supports for an entire roof in less than a day. This speed is made possible because the girders are easy to handle. Their center balance is determined at the plant, and eye-bolts are welded topside to facilitate handling. The eye-bolts are removed by flame-cutting after they have served their purpose.

Bearing plates are sent to the job ahead of time. When the erection crew arrives, each girder is lifted by a crane to the proper height and seated on the bearing plates. The crane holds it in position while two weldors fillet weld the girder's bottom flange to the bearing plates.

The erection record to date was made by a five-man crew, which set three jobs during an eight-hour day, a total of 24 girders.

Built-in Drainage

One of the most unusual features of this tailor-made girder is its built-in drainage control. Vertical dimensions of the ends or heels of the girders become progressively smaller. The difference is scarcely noticeable from the ground, yet it's enough to control water run-off from the roof.

While the tapered steel girder's built-in drainage feature can't be attributed to welding, it does affect shop work because no two girders on any one roof can be made exactly alike.

Another feature of these prefabricated girders is that they can be erected upside down, right-side up, separate, joined or even stood on end. If the client wants a flat roof, then the girders are erected upside down so that their tapered center section runs downward.

From the standpoint of weight reduction, the Ross-Carter welded span will weigh about 52 lb to the lineal foot. A typical 60-ft riveted span will weigh 86 lb per lineal ft. Weight reductions have been effected ranging from 30 to 200%, with the average about 45%.

The company has successfully shipped its lightweight welded girders as far east as Ohio—over 2,000 miles. The delivery was made by truck. Recently, the transportation problem became acute when a job called for a number of girders having a 123-ft span. The solution was an eight-wheeled stretch dolly.

Sales Manager Bill Sparr believes that welding has had a lot to do with Ross-Carter's success. It is the combination of structural engineering with welding shop fabrication techniques that has given the construction industry its first "packaged" girder—a girder that is designed, fabricated and erected entirely by one company.

Back-up Flux: New Aid to Welding

BY ALVIN L. BENNETT
Research Welding Engineer, Solar Aircraft Co., San Diego

MANY firms who are using back-up fluxes have reported highly beneficial results. Others doing similar work, however, lack knowledge as to how and when flux should be used. It is the purpose of this article to tell them.

In the welding of alloy steels, including stainless and the "super alloys," the prime problem is protection against oxides and nitrides. The alloy steels have a thin oxide film before welding, and additional oxides and nitrides are formed during the heating cycle. The primary function of a flux is twofold: to remove the existing film and to prevent the formation of additional film.

It has often been said that flux is not needed to prevent oxidation with inert-gas arc welding. True with respect to the top side of the work. In the welding of sheet materials, however, the shielding gas affords no protection to the back side of the work. Good quality welds in thin-gage materials are not possible with the inert-gas process unless one of the alternatives given below is used.

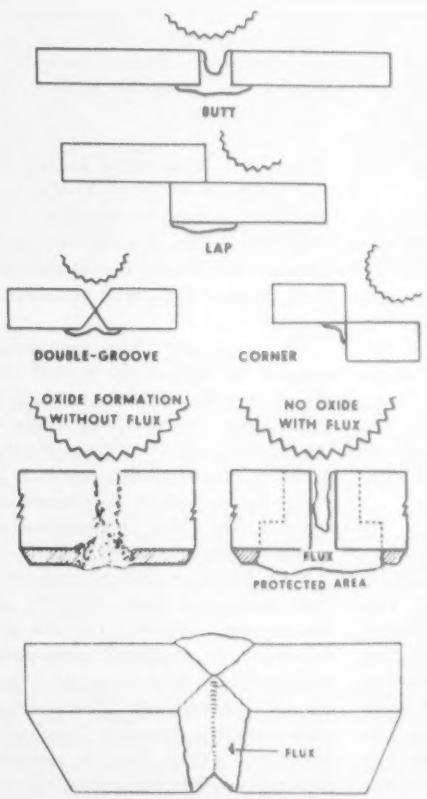
Four Ways of Protection

Several methods have been developed to provide protection against oxides. There are, in fact, four recognized techniques:

1. *Chipping back side.* One procedure is simply to disregard oxide formation. Welding is done on the front side without protection for the back. Then the operator chips away the oxidized metal and rewelds the back side. This method can give sound welds, but it is often unreliable and sometimes impossible to accomplish.

2. *Back-up bar.* A well-fitting back-up bar gives good support to the molten metal and retards the formation of oxides. It has, however, various disadvantages. When the work has a complex shape, a back-up bar is not practicable. Often a back-up bar represents a major piece of tooling and is expensive to produce. Sometimes it can be removed after welding; other times it must be welded into the job. When the back-bar is welded in, it almost inevitably curls slightly away from the weld. This results in the formation of two notches that reduce weld strength.

3. *Inert-gas back-up.* This method

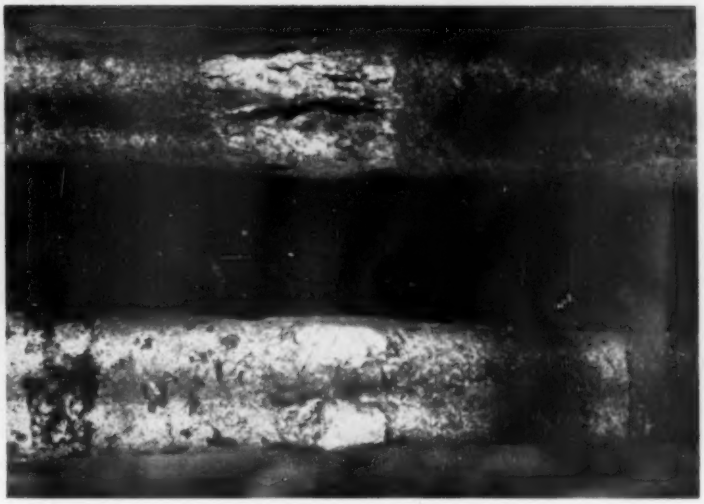


HOW flux back-up is employed in double groove and corner joints, butt and lap welds. Correctly used, back-up fluxes can reduce oxidation, help control penetration, lower costs and simplify operations in the welding of alloy steels, including stainless and the "super alloys"

SKETCH at left shows how flux back-up prevents oxidation of the underside of the weld. The flux coating inhibits troublesome chemical compositions

ADHERING tightly to the underside, the flux supports the molten metal of the root pass. Root beads are smoothed out, and the root weld metal becomes firmly bound in the alloy

BRUSHING flux on a part after tacking. Flux may also be sprayed or poured



LOWER section was welded with and top section (in which crack appears) without flux. Both joints were bent 180 degrees on root side

is often used to prevent oxide formation. In addition to the expense involved, gas offers no support to the weld metal unless it is put in under pressure and the pressure controlled as the weld progresses. This requires an elaborate, costly control mechanism. Inert gases also do not facilitate flow-out or penetration.

4. *Back-up flux.* Fluxes offer the advantages of low cost and ease of application. They also help to support the molten weld metal. There is one disadvantage: the flux may be hard to remove after the welding is completed.

To Use or Not

The decision as to whether flux should or should not be used on a specific job depends on a variety of factors. However, certain generalizations can be made:

A suitable flux is desirable on any alloy steel or "super alloy" where high-quality welding is necessary, provided that the removal problem does not force the use of a back-up bar or inert gas. Flux aids skilled operators to eliminate porosity, avoid overheating and control penetration; it also helps inexperienced or semi-skilled operators to obtain quality workmanship. When flux is used, back chipping or grinding can be eliminated as can welding from two sides (unless it is necessary for warpage control).

Flux residue is often hard to remove after welding. To offset this disadvantage, the high quality and high speed of the welds obtained usually justifies the expense of pickling or sandblasting for flux removal.

The removal problem may be simplified by using a chemically inert flux. Such fluxes are not detrimental in their refractory state after welding and need only be removed if: (*a*) the part will be operated in service above 1,000 F; (*b*) there is danger of contamination (such as might result from contact with food acids); or (*c*) visual inspection requirements call for a clean welded surface. Grinding and polishing—which will remove the flux residue—are often necessary in any case to meet appearance specifications.

Nine Ways to Benefit

How will the use of flux aid the weldors of alloy steels? It is possible to cite nine major benefits. These are:

1. *Porosity can be eliminated.* When gases or refractory oxides are included in the weld, they often form pockets and pinholes upon cooling. The result is a porous weld. A flux can be selected that is a strong deoxidizer as well as a good wetting agent. It will either dissolve oxides or pick them up and float them to the surface, thereby eliminating the porosity caused by dissolved gases or slag.

2. *Root notches or cracks can be avoided.* Usually root notches or cracks are caused by uneven heating or overheating of the weld metal. Molten flux acts as a good conductor of heat, dispersing localized areas of high temperature. Uniform heat distribution and metal flow in the root prevent the formation of notches and cracks.

3. *Ductility can be retained in the weld metal.* Since flux acts to spread heat over a larger area, the cooling rate is slower and more uniform. By eliminating rapid chilling, hard or brittle spots are less likely to occur in the weld. Result: a more ductile weld.

4. *The amount of penetration can be controlled.* The fluxing action lowers the surface tension of the molten weld metal and so improves its wetting ability. Flux allows the molten weld metal to penetrate the seam thoroughly and to fuse solidly with the parent material at the weld root. A more even penetration is secured.

5. *Grinding time can be cut down.* The use of flux makes it possible to do finish grinding on the penetration rather than on the welding side, thus cutting down grinding time. Since weld penetration is controlled, the result is a very narrow, low, smooth bead on the root side. This is easier to grind than the wide, comparatively rough bead on the weld side.

6. *Welding can be done from one side only.* Usually there are two reasons for making welds from both sides. One is to control warpage—and here flux is no solution. The other reason is to eliminate notches and cracks in the root. These are pre-

JOINING stainless-steel convolutions to carbon-steel pipe. Back-up flux is useful in welding dissimilar metals (or dissimilar thicknesses of same metal)

vented by the use of back-up flux.

7. *It is easier to join materials of unequal thickness.* When thick and thin materials are to be joined, burn-through is prevented by the use of flux. The reason is that the flux distributes the heat evenly over a larger area.

8. *Operators are helped to make good welds.* The action of flux in supporting the molten metal and causing the metal to flow makes good welds easier to achieve.

9. *Semiskilled weldors are aided.* The same factors that help skilled operators are also of value in getting acceptable welds from operators unskilled with alloy steels or who are learning to weld.

Carbonless Fluxes

These benefits from the use of fluxes in the welding of alloy steels are generally recognized in the aircraft industry as the result of experience gained in manufacture during World War II. Aircraft companies were forced to hire untrained workers and teach them to weld great quantities of stainless and other high-alloy materials. Solar, at that time, was bothered by difficulties with carbon pick-up in welds, and it was recognized that one important source of carbon pick-up could be eliminated by not using shellac as a binder in flux. Shellac contains carbon, which is particularly detrimental to alloy steels. As everyone who has worked with such steels knows, carbon tends to make them brittle and welds high in carbon are quickly attacked in pickling solutions.

Early in the war, Solar began research on new types of flux that would adhere to the work without shellac. These fluxes were tailored for gas welding processes and were used in huge quantities. Later we developed other flux types for arc welding.

How Flux Is Made

Solar develops these fluxes primarily for the company's own use, in the high-production welding of exhaust systems, jet engine parts and various other aircraft components made of alloy steels for service under high-temperature conditions. Later it was decided to sell the fluxes to other aircraft firms and to metalworking concerns generally.

Suitable fluxes for alloy steels are a mixture of compounds of calcium, titanium, silicon, manganese, sodium and other elements, varying with the job that the flux must do. These compounds are formed into a powder of carefully controlled fineness, which is mixed into a paste with methyl alcohol before it is applied.

In the flux are several specific agents—scavengers to attract oxygen; slag formers to protect the metal while it is cooling; binders to hold the flux to the metal; and fluxing agents to cause an even flow-out of the metal by lowering its surface tension and aiding fusion during the heating cycle. The ingredients are further combined to provide protection during different temperature ranges; the flux must melt at the correct point but yet not be so fluid that it runs away from the heat as the temperature increases. Finally, the whole mass must form a protective slag blanket over the weld.

How to Use It

In use, the flux powder is mixed with methyl alcohol, in about the proportion of four parts of flux to one of alcohol by volume. This forms a paintlike slurry; that is, a thin, watery mixture. This is left to stand for a few minutes to allow a chemical reaction between flux and alcohol.

The mixture is applied to the edges of the joint before tacking and to the back of the seam after tacking but before welding. It may be applied to the back of the joint before tacking if the fixture is so designed that the flux is not scraped off during alignment. Application can be by spraying, brushing or pouring. Once the flux has been applied, welding may proceed immediately, or parts may stand for days before they are welded.

If properly used, flux can be of tremendous value in welding alloy steels. As an example, one firm manufactures intake manifolds of SAE 4130 that must be expanded and swaged after welding. Before the use of flux, these components would break, necessitating extensive repair work. After a back-up flux was used, the amount of repair work was cut from 97% to 1%. The reason, of course, is that the full ductility of the metal was retained in the weld and heat-affected zones.

Another company was fabricating piping systems. These tended to break under vibration. The trouble was traced to notches at the root of the joint caused by a back-up ring. By substituting flux, the back-up ring was eliminated and with it the resulting notches and cracks.

Today, work is in progress to eliminate the one disadvantage of flux—the removal difficulty. This is a real problem since the very properties that render a flux useful are the ones that make it hard to remove. Flux, in effect, forms a glasslike coating on the metal. Naturally, this is hard to remove. The aim of the present research is to make this coating revert to some form that will easily break away after welding.

Flux offers several major benefits to metal fabricators—its economy, its improvement of weld quality and its ability to make the job of the operator easier. Those who weld alloy steels are missing a bet unless they investigate its applications.

Ket Shoots the Wad

Kettlehead thought that betting on a "dog to weld" is a surer way of making money than betting on a dog at the tracks. But somebody crossed him up.

BY CLEMENT HOWARD

OLD Kettlehead must have been a bottle-fed baby because he never got over the habit of tipping a bottle up to his lips. At this time he was working in a roundhouse welding shop. They had taken him on more or less at his own valuation because good weldors—those who knew railroad procedures and how to weld the many different metals used on the big locomotives—didn't walk through the gate very often.

STILL A BLOW-HARD

Ket could handle a stinger like a juggler. He could even shift it from one hand to another without a ripple out of place in the weld. He was good, all right, but he knew it and that spoiled it. Also, he started riding herd on his helpers and made life so miserable for them that nobody would stay to work for him more'n a week. His fellow weldors knew him for a loud-mouth, but as his work was always above par they let him alone.

Ket's foghorn blaring and bellowing at his helpers got to be accepted as a necessary evil at the roundhouse. Nobody thought of doing anything about it. Then one day a quiet young kid of about 22 walked in looking for a job.

Old Ket was minus a helper, as he was about once every week, so they assigned this new kid to him. The kid didn't say much and never complained. He took Ket's abuse without a word, and some of it was pretty raw. Like one day the youngster had picked up a torch and tried to do some welding. He'd barely got started when Ket came in, snatched the torch out of his hand and bellowed at him, "Leave that torch alone! I'm the weldor around here! I can weld anything that needs welding."

The kid just shrugged it off without saying a word. Some of the boys felt sorry for him, and one or two of them gave him a friendly wink. That was all, though. Everybody took the attitude that what Ket said to his helper was Ket's own business.

A DOG TO WELD

A day or so after that little episode, the general foreman walked in with a 4-in. bronze check valve. The boys all knew that this baby would be a dog to weld. They were leery of anything made of bronze around that shop because the guys in the yard foundry had been remelting all the bronze scrap they could get their hands on and had turned out a lot of bronze castings that were heavily alloyed with lead. Sometimes the lead ran over 10%. It made the valves easy to machine, all right, but, brother, what it did to the welding!

The foreman beckoned to Old Ket and told him to weld up a crack. The side was already veed out and ready for the torch. Ket hadn't worked on a bronze job before, so the rest of the boys crowded around to see what would happen. Ket shoulda been suspicious but instead he was rather flattered by all the interest that was being shown in him.

"Now here's the way I weld bronze," he told the kid, and started in to show off.

They had to admit that he knew how to go about it. He used a big preheating torch and put a big tip on his torch. He really threw the heat into that valve. So far so good, but when he adjusted his torch, the wiseacres in the gang knew he'd cooked his own goose. But brown!

Ket finished up the valve in jig time, quenched it and examined the weld. It didn't look bad, even though the weld metal and the surrounding area were kinda spotty. He hooked the valve up with the hose and turned the pressure on. Then came the deluge.

Boy, you shoulda seen that thing leak! Spray was going in every direction, and the spectators scurried for cover. Someone started to laugh, and pretty soon there was a general guffaw going around. Ket glared at everybody, and the foreman glared back at Ket. "So you can weld anything, can you?" the foreman sneered. "It sure looks like it. Now who's going to try to clean up this mess?"

SOME of the fellows wanted to make side bets. . . Ket covered them all until his roll was gone

That long-suffering helper started in to say something, and Ket snapped at him to shut up. "I suppose you think *you* could weld it?" he snarled.

The kid was a patient soul, all right, but that last blast was too much. "I know I can," he answered quietly.

Remember the guy in the old Bible story whose jackass talked back? Ket was nearly that astounded. For a minute he was beyond speech. Finally, though, he reached into his pocket, pulled out his roll and peeled off a twenty. He slammed it down on the slab with Andy Jackson's face showing and roared. "Put up or shut up!"

He thought that would fix the kid, but it didn't. The kid found two tens of his own and put them down on top of Ket's twenty. "All right," he said. Then he picked up the check valve and began to grind out Ket's weld.

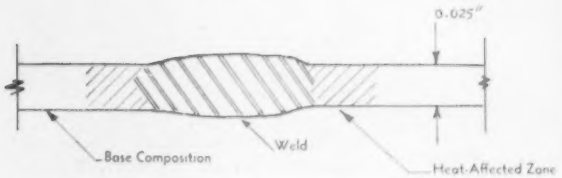
EASY MONEY FOR SOMEONE

Some of the fellows, impressed by the matter-of-fact way in which the kid had started to work, wanted to make side bets. By the time Ket had covered them all, his roll was gone. He didn't mind, though, because he expected to double everything he laid out—no odds were being asked or given. Not until the last bet had been placed did Ket get around to see what the kid was doing. By this time he had finished preheating and was starting in to weld. When Ket looked at the flame that the kid was using, his eyes nearly bugged out.

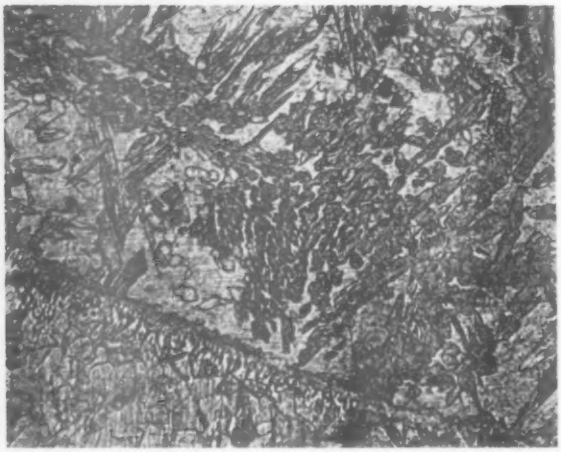
(Continued on page 48)

How to Weld . . .

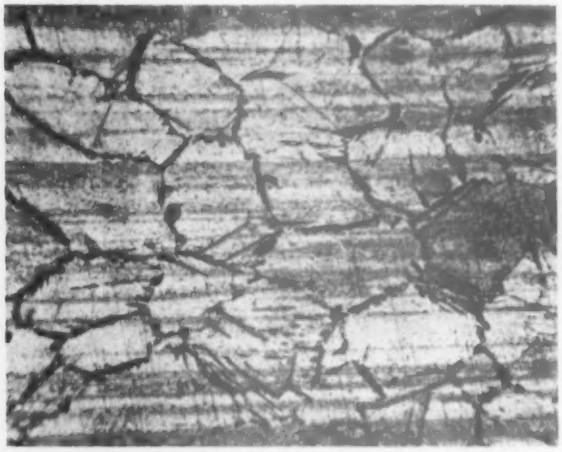
Butt Joints



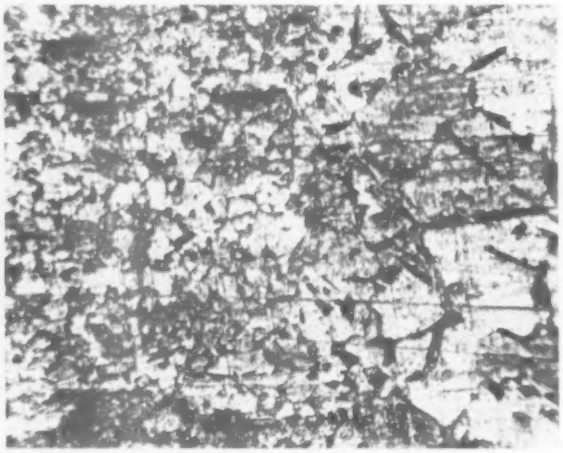
1—SHIELDING gas was argon. Flow was at a rate of 18 cfm. A 1/16-in. diam tungsten electrode was used



2—NORMAL grain size appears at junction of weld and parent metal (arrow indicates weld), type 302 stainless



3—WELD in type 430 stainless: large grain growth is indicated within the weld area. Compare with Figure 2



4—RAPID transition of type 430 from fine-grained structure of parent metal to coarse-grained structure

Ferritic stainless steels are acceptable substitutes in many instances for the nickel-bearing austenitic stainless steels. Here's the dope on welding them.

BY LESTER F. SPENCER
Chief Metallurgist,
Landers, Frary & Clark

WHEN a nickel shortage occurred simultaneously with a tremendous growth in demand for nickel-bearing stainless steels, many fabricators were forced to accept substitute materials for such standard alloys as types 302, 304, 305, 321 and 347 stainless. The most logical substitutes are found in the straight-chromium stainless steels, particularly in the group known as the "ferritic" alloys.

The ferritic alloys are magnetic (unlike the nickel-bearing stainless steels) and are called "non-hardenable." They are hardenable to only a small extent, if at all, and have their maximum ductility, softness and corrosion resistance in the annealed condition.

Chromium contents of the ferritic alloys range from 11.5 to 27.0%. Type 405, which has the lowest chromium range (11.5-13.5%), is not considered to be a satisfactory substitute for the chromium-nickel stainless steels because of its inferior corrosion resistance. At the high-chromium end of the ferritic group is type 446 with a range of 23.0-27.0% chromium. This is the heat-resistant alloy of the group; it will resist excessive oxidation up to a maximum temperature of 2,100 F.

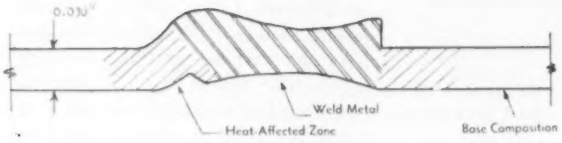
TYPES 430 AND 430T

Type 430, with a chromium range of 14.0-18.0%, represents an acceptable compromise between types 405 and 446 and is useful for many more applications than either. It must not be thought that stainless type 430 is a new analysis. It has been used in the past for such applications as automotive trim, radiator grilles, cooking utensils, exterior and interior ornamental mouldings on buildings, etc.

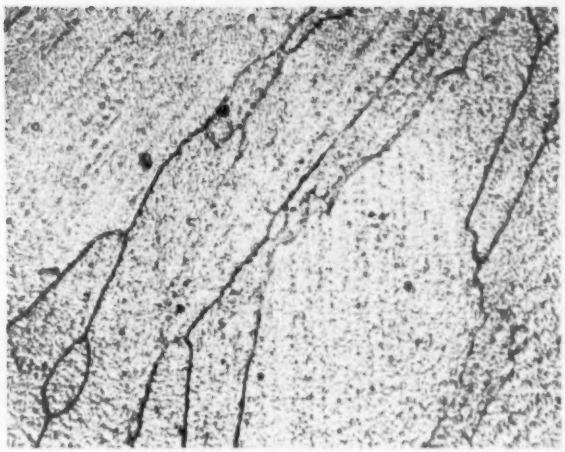
A variation of type 430 is the non-standard analysis identified as 430T.

. . . 430 Stainless

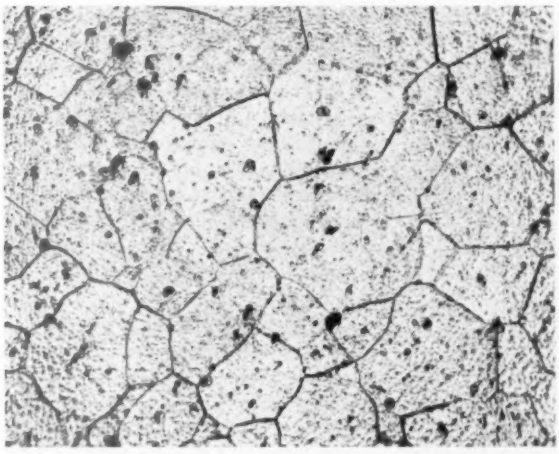
Lap Joints



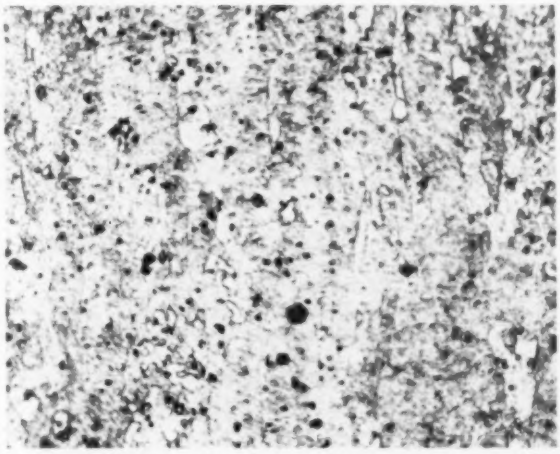
5—SKETCH of lap joint for tests of 430 stainless. Again the tungsten inert-gas welding process was used



6—ELONGATED grains indicate severe grain growth within the weld area. The material is type 430T stainless



7—LARGE grain growth extends to the heat-affected zone. This weld was also made in type 430T stainless



8—NORMAL structure of base metal. All photomicrographs on this and opposite page were taken at 125X

The "T" indicates that titanium is present at a value of approximately seven times the carbon content. Type 430T, although not at the present writing listed as an AISI standard, has been developed and introduced by several producers as a more weldable grade of type 430 stainless.

This paper will be concerned primarily with the welding of type 430 and its modification, type 430T. It must not be thought, however, that weldability is the only characteristic to be considered in shifting from a chromium-nickel stainless. Qualities such as corrosion resistance, heat resistance or ductility may be even more important from the standpoint of the designer or the plant engineer. To evaluate the substitute material properly, we at Landers, Frary & Clark have found it necessary to produce several completed items and place them through an intensive test procedure.

Table I gives comparative mechanical properties of AISI types 1020, 302 (18-8 stainless), 430 and 430T. Table II gives the chemical compositions of the stainless steel types that are most frequently employed.

Corrosion and Heat

The corrosion resistance of both 430 and 430T compositions is exceptionally good. Both alloys resist atmospheric corrosion although they may show some tarnish or discoloration under certain conditions. They are resistant to weak organic acids and to oxidizing acids such as a nitric acid solution. However, they do not have the superior pitting resistance to dilute reducing acids that characterizes the chromium-nickel stainless steels. Thus type 430 stainless would seldom be a satisfactory substitute in applications where initially type 316 stainless was required.

Type 430 has a high resistance to scaling at elevated temperatures. It will resist flaking during high temperatures, and this property often extends the life of equipment. On the other hand, type 430 stainless and its modification do not have the high strength at elevated temperatures characteristic of the chromium-nickel stainless steels; this fact should be considered by designers of equipment for high-temperature service. Type 430 stainless also has a tendency to become quite brittle at room tempera-

Table I. Mechanical Properties of 430 Compared to Other Steels[7]

Property	1020	302	430	430T
Ultimate tensile strength, psi	55,000	85,000	70,000	65,000
Yield point, psi	40,000	40,000	50,000	45,000
Elongation, % in 2 inches	30	55	25	30
Hardness, Rockwell B	70	85	85	78

Table II. Chemical Compositions of Common Stainless Steels

Type	Cr, %	Ni, %	C, %	Mn, %	Si, %	Other Elements, %
302	17.0/19.0	8.0/10.0	0.08/0.20	2.0 max.	1.0 max.	....
304	18.0/20.0	8.0/10.0	0.08 max.	2.0 max.	1.0 max.	....
305	19.0/21.0	10.0/13.0	0.12 max.	2.0 max.	1.0 max.	....
316	16.0/18.0	10.0/14.0	0.10 max.	2.0 max.	1.0 max.	Mo, 1.75/2.75
405	11.5/13.5	....	0.08 max.	1.0 max.	1.0 max.	Al, 0.10/0.30
430	14.0/18.0	....	0.12 max.	1.0 max.	1.0 max.	....
430T	16.0/18.0	....	0.10 max.	1.0 max.	1.0 max.	Ti, 0.30/0.70
446	23.0/27.0	....	0.35 max.	1.5 max.	1.0 max.	N, 0.25 max.

Table III. Effect of Electrode Composition on Bend Tests[5]

Electrode	Condition of Weld	Base Metal	Bend with Weld		Bend across Weld	
			Bend	Break	Bend	Break
17 Cr	As-welded	17 Cr; 0.06 C	11°	In Weld	6°	In Weld
17 Cr	As-welded	17 Cr; 0.11 C	7°	In Weld	33°	In Weld
25-12	As-welded	17 Cr; 0.06 C	58°	Adjacent Weld	73°	Adjacent Weld
25-12	As-welded	17 Cr; 0.11 C	180°	....	180°	....
17 Cr	Heat treatment:	17 Cr; 0.06 C	180°	....	180°	....
17 Cr	1,450 to 1,500 F,	17 Cr; 0.11 C	180°	....	180°	....
25-12	air cool	17 Cr; 0.11 C	180°	....	180°	....
25-12		17 Cr; 0.06 C	180°	....	180°	....

ture after prolonged operation at temperatures in the 800-1,000 F range.

Grains Grow Large

The straight-chromium steels may be welded by most methods recommended for mild steel with the exception of carbon-arc welding.[6] When any method of fusion welding is employed, the welded joint will exhibit grain growth in both the weld and the heat-affected zones. This coarse-grain structure is usually associated with weld brittleness. When subjected to welding temperature, type 430 stainless will have an altered structure; a portion of the ferrite transforms to austenite and later retransforms to martensite (or to a low-carbon pseudo-martensite) upon rapid cooling. This fine martensite will envelope the ferrite grains[5] and render the material brittle as determined by a bend test. The martensitic formation is considered to be more of a contributing factor toward weld brittleness than the large grain growth.

It has been stated[6] that the welding method chosen will be an important factor with regard to grain coarsening at welding heat as well as to the extent of martensite in the weld structure. The oxyacetylene procedure produces the largest grain size and the maximum amount of martensite; joints made by this method have the lowest ductility. Metal-arc welding has less heat input than the oxyacetylene process, and the Tig (tungsten inert-gas) process has the lowest heat input of the fusion-welding procedures. Resistance welding has the lowest heat input of all, however, and as a result produces the highest weld ductility in the as-welded condition.

Even when the ductility of the all-welded joint is poor, sound welds may be produced insofar as complete fusion and porosity are concerned. As mentioned previously, welded structures of type 430 stainless can be employed for elevated-temperature service with success. The ductility of the weldment increases rapidly upon the application of heat, a maximum ductility being realized at a temperature of 400-500 F. The brittle structures experienced when cooling from a high operating temperature to room temperature can be made fully ductile by reheating the structure to a temperature of 1,400-1,500 F, followed by a rapid cool.

A suggested remedial treatment to reduce the brittleness of weld in 430 stainless is a furnace anneal to approximately 1,300-1,500 F, followed by air cooling.[1,3,5,6,7] After a low-temperature furnace anneal, oxyacetylene-welded tubing may be flattened and crushed without cracking in either the weld or metal adjacent to the weld.[1] This will be further discussed.

With regard to the welding rod or electrode, the same composition or one with slightly higher chromium content can be used. The higher-chromium rod is used where there is a danger of chromium loss from the base composition through volatilization during welding. The straight-chromium electrodes are magnetic and hence subject to arc blow in d-c welding. Hence they will not run as smoothly and will have slightly more spatter than austenitic stainless electrodes.

Where high-ductility welds are desired, an austenitic chromium-nickel electrode, such as 302, 308, 347, etc., is recommended. With the austenitic rod, the weld will be ductile, although there may be a narrow zone next to the weld with some grain growth. The disadvantage in the use of an austenitic rod to weld a ferritic stainless (type 430) is that there are two separate compositions, each having its own rate of expansion. If a structure so welded is subjected to intermittent heating and cooling, the expansion will take place at different rates. This may stress the metal sufficiently to cause ultimate failure.

Preheating and Annealing

Even though the ferritic stainless compositions are considered non-hardening, they are normally preheated before welding; the temperature employed is usually at 300-350 F and is preferably maintained during welding. Preheating should be done in the welding of heavier sections of stainless type 430. It is even more necessary in the welding of the higher-chromium stainless such as type 446.

After welding has been accom-

Table IV. Mechanical Properties of Type 430 Fusion-Welded Joints[6]

Base Metal Type	Welding Procedure	Filler Metal Type	Conditions Prior to Testing	Ult. Tensile Strength, psi	Elongation, % in 2 in.	Location of Fracture*	Guided Bend Test
430	Oxyacetylene	430	As-welded	72,400	6.3	HAZ	15 deg
430	Oxyacetylene	430	Annealed	68,200	7.0	HAZ	50 deg
430	Metal-arc	430	As-welded	76,000	15.6	BM & WM	15 deg
430	Metal-arc	430	Annealed	73,900	30.0	BM	180 deg
430	Metal-arc	308	As-welded	76,100	26.3	BM	85 deg
430	Inert-arc	430	As-welded	74,400	26.6	BM	38 deg
430	Inert-arc	430	Annealed	72,000	28.4	WM & BM	180 deg
430	Inert-arc	308	As-welded	74,400	23.6	BM	85 to 180 deg
430T	Metal-arc	308	As-welded	71,800	25.6	BM	180 deg
430T	Inert-arc	None	As-welded	70,700	25.0	BM	180 deg

* HAZ = Heat-Affected Zone; BM = Base Metal; WM = Weld Metal

plished, the weldment should be annealed if it is to be subjected to either high stress concentrations or impact. J. C. Hodge[1] recommends a temperature of approximately 1,450 F, subsequently followed by a furnace cooling to approximately 1,100 F and then by air cooling to room temperature. Even after annealing, however, it is felt that weldments of type 430 stainless should not be subjected to severe impact at room temperature since the inherently large grain size is always present and may be detrimental.

Hodge[1] gives Charpy impact values of as-welded, furnace-cooled and air-cooled specimens. Although the impact toughness is fair with the annealed specimens, it is still not equal to that of the unwelded parent metal.

An interesting discovery is that the toughness of the weldment is a direct function of the chromium content within the analysis. The impact resistance of the weld metal has been found to reach low values after the chromium content within the base composition is above 16.25%. Thus, says Hodge[1], highly stressed parts made from type 430 weldments should have a relatively narrow chromium range, generally from 15.0 to 16.0%. If this range will not give the desired corrosion resistance, it may be advisable to raise the chromium content within the base metal to 17.20%.

The tensile strength of a 430 stainless weld is not greatly affected by the chromium content within the base metal. A representative value for tensile strength after arc welding is 95,000 psi; the same type of specimen after a full anneal at 1,450 F showed a tensile strength of about 85,000 psi.

Table V. Olson Cup Values on Inert-Gas Butt Joints
(No filler rod—all sheets 0.025 in. thick)

Type of Stainless	Condition	Average Cup Values, In.	Bend Test
302	As-received	0.425	Bent 180 degrees on a radius equal to the sheet thickness. No failure.
302 to 302	As-welded	0.400	Bent 180 degrees on a radius equal to the sheet thickness. No failure.
430	As-received	0.295	All specimens bent 180 degrees on a radius equal to the sheet thickness. No failure.
430	As-received	0.285	
430	As-received	0.298	
430	As-received	0.286	
430 to 302	As-welded	0.215	
430 to 430	As-welded	0.090	As-welded samples broke from 35 to 50 degrees. Annealing of samples gave better bend results: approximately a 165-degree angle before breakage was experienced.
	As-welded	0.088	
	As-welded	0.082	
	As-welded	0.078	
	Annealed*	0.223	
	Annealed*	0.235	
	Annealed*	0.235	
405	As-received	0.287	Bent 180 degrees on a radius equal to the sheet thickness. No failure.
405 to 405	As-welded	0.049	As-welded samples broke at approximately 40 degrees. Annealing of samples gave better bend results: a 155-degree angle was obtained before breakage was experienced.
	Annealed*	0.230	
430T	As-received	0.305	Bent 180 degrees on a radius equal to the sheet thickness. No failure.
430T to 430T	As-welded	0.272	Both as-welded and annealed specimens were bent 180 degrees on a radius equal to the sheet thickness. No failure.
	Annealed*	0.253	

* Annealing at 1,350 F for 1½ hours, followed by an air cool

Metal-Arc Welding

In the metal-arc welding of 430 stainless, coated electrodes of either the same composition as the base metal or austenitic electrodes may be employed; the choice depends upon the specific service conditions of the part and the weld properties desired. With regard to electrode composition, the values given by Pruger[5] in Table III may be of interest.

The electrode is positive and the work negative (reversed polarity). Electrode diameter varies with the thickness of material to be welded. A 5/64-in. electrode can be used for materials up to 0.050 in.; a 3/32-in. electrode in a thickness range of 0.050 to 0.0625 in.; a 3/32 or ⅛ in. electrode for thicknesses of 0.0625 to 0.140 in.; a ⅛ to 5/32 in. electrode in the range of 0.140 to 0.1875 in.; and a 3/16-in. electrode for thicknesses of 0.250 in. and heavier. Both electrode diameter and current settings should be proved through ex-

periment before engaging in production welding.

As in the welding of other material, cleanliness of the work is a prerequisite and the edges must be properly beveled where multipass welding is performed.

Oxyacetylene Welding

Where oxyacetylene welding is employed, the torch size should be one or two sizes smaller than ordinarily used for the same thickness of plain-carbon steel. The use of a smaller flame is recommended[4] because of the characteristic heat conductivity of the 430 material. A neutral flame is preferred as volatilization of the chromium from the base metal is apt to occur where an oxidizing flame is employed. Where a strictly neutral flame is difficult to maintain, a slight excess acetylene feather will prevent any possibility of the flame going over onto the oxidizing side.

Bare filler rods containing from 1.0 to 1.5% more chromium than the base metal are recommended. The rod should also be slightly higher in both manganese and silicon content so that these necessary elements will not be excessively reduced.[4] Do not employ strips cut from the base metal as welding rods. Such strips are more readily oxidized and tend also to assume a spiral form, which interferes with uniform feeding into the weld. The use of strips is permitted only when the base composition is not known.

In order to reduce oxidation, a flux having a high solvent power for chromium oxide should be used. The flux should be mixed to a consistency of a thin paste in a non-metallic container and applied to both sides of the base metal and the welding rod. Careful flame control[4] with minimum puddling and no excess of heat will keep the amount of oxides low, and by using a special flux the chromium oxides can be practically eliminated. An angle of approximately 80 deg is satisfactory for the position of the flame in respect to the plate; the tip of the inner cone should be kept about 1/16 in. from the pool of molten metal.

As previously mentioned, type 430T stainless was developed primarily to provide better welding characteristics than type 430. It has been stated[7] that the improvement is accomplished by alloying conditions and a chemistry balanced to control grain growth and the structural transformation produced at the time of welding. The modified type produces a fairly ductile weld in both the as-welded and the annealed conditions. Table IV indicates that the as-welded ductility of 430T as measured by the elongation is very near to that given in the inert-arc welding of type 430. This indication is brought out even more clearly by the bend-test results given in the same table.

The author has done similar work in evaluating the ductility of types 302, 405, 430 and 430T stainless by means of the Olson cup test. The cup test, a rather new method of evaluation of weld joints, was performed along with the standard bend test in determination of the property of ductility. A simple butt joint (Fig. 1) was used with a stock thickness of 0.025 in. The weld joint was placed in direct center of the test equipment so that the cup formed was directly on the weld line. Welding was done by the Tig process, using 50 amp at 48 volts, a 1/16-in. tungsten electrode and an argon shielding gas flow of 18 cfm. The speed of welding was 12 ipm. Test results are given in Table V.

Lowered Ductility

Emphasis has been placed on the fact that the ductility of either type 430 or 430T does not approach that of type 302 stainless. At Landers, Frary & Clark, we found that the operations on press-drawn parts had to be changed to accommodate the reduced ductility of type 430 sheet and strip. A cup test indicated that the ductility of type 430, as received, is approximately 30% less than that of type 302 stainless. The difference in cup ductility between types 430 and 302 stainless in the as-welded condition is even more apparent. When type 302 was welded to type 430 stainless, the straight-chromium member of the joint was the weak portion where failure occurred. Thus a decrease of approximately 50% was realized between a composite weld of types 302 and 430 as compared to type 302 weld; and a decrease of approximately 85% was realized between a type 430 weld and that displayed by a type 302 weld joint. Upon annealing the type 430 weldment, a substantial increase in ductility over the as-welded condition was obtained; however, the ductility was still under the cup value of type 430 in the as-received condition.

Type 430T showed surprisingly good cup values in the as-welded condition; however, the values obtained were still approximately 10% lower than those obtained from the as-received sheet material. The subsequent annealing treatment of type 430T specimens did not increase the cup ductility of the as-welded specimens but detracted from the values obtained. This may be due to the fact that the annealing temperature may have not been high enough.

Metallographic Studies

In the metallographic studies of 430 welds, the microstructure at 125X revealed that a large grain growth had occurred, which is one of the factors of low ductility.

In butt joints of the type sketched (Fig. 1), the photomicrograph of Fig. 2 shows "normal" grain size in the junction of weld and parent metal of type 302 stainless. Fig. 3 shows large grains within a type 430 weld area. Fig. 4, taken at the junction of weld and parent metal on a type 430 weld, shows the rapid transition in grain size from the coarse-grain structure at the junction to the fine-grain structure of the parent metal.

Metallographic studies at 125X were also made of lap joints welded by inert-gas welding. The diagrammatic sketch of the test lap joint (Fig. 5) shows the location of the weld and heat-affected zones. The elongated grains of Fig. 6 and the large grains of Fig. 7 should be compared to the normal structure of the base metal, Fig. 8. However, a fair cup test value was obtained on the welded samples, indicating that the "martensitic envelope" previously mentioned was either minimized or completely eliminated.

It is an established fact that the tungsten inert-gas welding procedure is the most suitable method of fusion welding. This is especially true in the welding of type 430T stainless since the inert gas aids in the retention of titanium within the weld deposit.

As to the corrosion resistance of types 430 and 430T, Pruger[8] has published some test comparisons of inert-gas welding procedures with filler metal and resistance welds. A type 430 weldment in the as-welded condition showed relatively poor corrosion resistance in the weld metal area, but the annealed specimen of the same analysis (annealed at approximately 1,450 F) satisfactorily passed the cor-

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rosives used for testing. It was indicated, however, that fusion welds made in type 430 stainless would have satisfactory corrosion resistance in the as-welded condition for atmospheres where moisture is the only corrosive medium. The addition of titanium to type 430 stainless did not materially improve the corrosion resistance. Types 430 and 430T reacted very similarly in that both required an anneal to restore the corrosion resistance of the weld area.

Resistance Welding

Spot welding is an excellent method of joining type 430 stainless. Under static loading[6], the shear strengths are almost twice the minimum values published by the American Welding Society for chromium-nickel types of stainless. Annealing after welding does not appreciably improve the tension-shear results[6] on welds under static loading, but it will improve ductility and perhaps resistance to vibration. Type 430T is not believed to be any better than type 430 with regard to spot-welding quality.[6] It has been stated, however, that type 430T will improve corrosion resistance of the weld area.[8]

As in the welding of other types of materials, the variables that must necessarily be controlled in order to obtain satisfactory spot welds are (*a*) current, (*b*) the diameter of electrode tips, (*c*) force and (*d*) the length of time the current is allowed to flow.

Once an electrode tip has been selected, this value should remain constant. Any increase in contact area will tend to reduce the heat per unit area, resulting in an improperly or poorly fused joint. On the other hand, a decrease in contact area will tend to increase the heat per unit area, resulting in a hole, which may be either partially or entirely through the sheet.

The force variable will usually determine the percentage of indentation obtained in the weld area; too much force will also reduce the resistance of the joint and tend to decrease the amount of generated heat. The time variable is as important as the current flow. If the time period is too long, a burning of the weld will result, very similar to that obtained from too much current. Too short a contact produces no welds. It is suggested that electronic timing be employed as the weld time can then be controlled to cycles (1/60 of a second).

Pulsation, projection and seam welding are governed by conditions similar to those for spot welding. We obtained excellent strength values for seam welds on sheets of 0.033-in. thickness. For nine test specimens, the range of tensile strengths was between 68,000 and 75,700 lb, and only two specimens broke on the weld. These results were confirmed by metallographic studies of the weld area.

Unfortunately, it is almost impossible to set up specific procedures for the resistance welding of type 430 stainless steel since each individual machine requires adjustment of the variables mentioned. After the optimum values for current, time and force have been determined by experiment, however, they can be maintained by such devices as motor-driven cams, electronic tubes, etc. Difficulty may be experienced in determining the adjustment of these variables for manual operation because of the human element.

In general, types 430 and 430T can be resistance welded successfully. Usually less heat is required than for the same gage in carbon steel because of the lower heat conductivity, lower melting point and better surface conditions of the chromium-iron alloy. When resistance welding is employed, the metal will discolor for a short distance on each side of the weld. This is caused by an oxide film, which should be removed by pickling, grinding or polishing. If this oxide film is not removed and the surface becomes alternately wet and dry, the color in the weld area will change from blue to a brown resembling iron rust.

References

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[2]Republic Enduro Stainless Steels, 1951 ed., Republic Steel Corp., Cleveland.

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[4]The Oxyacetylene Handbook, 1947 ed., Linde Air Products Co., New York City.

[5]How to Get Better Welding Results with 17% Chromium Stainless, T. A. Pruger, *Steel Horizons*, Allegheny Ludlum Steel Corp., Pittsburgh.

[6]Fabrication of Type 430 Stainless Steel, Oct. 10, 1951, Armco Steel Corp., Middletown, O.

[7]A Guide to Type 430 Stainless Steel as Alternates of the 18-8 Series, Republic Steel Corp., Cleveland.

[8]How to Increase Corrosion Resistance After Welding, T. A. Pruger, *Steel Horizons*, Summer 1952, Allegheny Ludlum Steel Corp., Pittsburgh.

KET SHOOTS THE WAD

(Continued from page 41)

That kid had the damnedest adjustment on his torch! Just a little flame with a short envelope and a small white cone. You'd recognize it at once as a flame that was highly oxidizing. Ket thought the kid had gone crazy. Who ever heard of trying to burn up good bronze like that?

When the kid got through, Ket pretty near split a kidney laughing. That weld was the crummiest looking thing he'd ever seen. The surface was all dark; the metal looked almost like it had been burned, and the beads were rough and kinda mealy from all that excess oxygen. Just what you'd expect from a beginner who didn't know better. Ket started to pick up all the money that was on the slab, but the kid stopped him.

The kid cooled the valve and hooked it up to the test hose with a pressure of 100 psi. Lo and behold! The valve was pressuretight. Not a sign of any moisture came through. The kid looked around at the various faces and then slowly picked up his two tens and Ket's twenty. "You see?" he said.

Ket didn't see—not until somebody explained it to him afterwards. His mouth fell open a foot, he rubbed his eyes, scratched his big ear and began to mutter, "I'll be an S.O.B."

Poor Ket! Not being much for reading, he'd never learned that lead will boil in bronze when the lead content is over 5%. The boiling takes place at welding temperature and it causes porosity all through the weld metal and into the heat-affected zone. The excess oxygen adjustment stops the boiling and so leaves the metal dense.

That kid was no fool.

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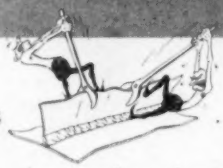
minimize stress  ...distortion ...warpage with Low Temperature EUTECTIC WELDING ALLOYS

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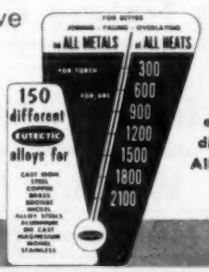

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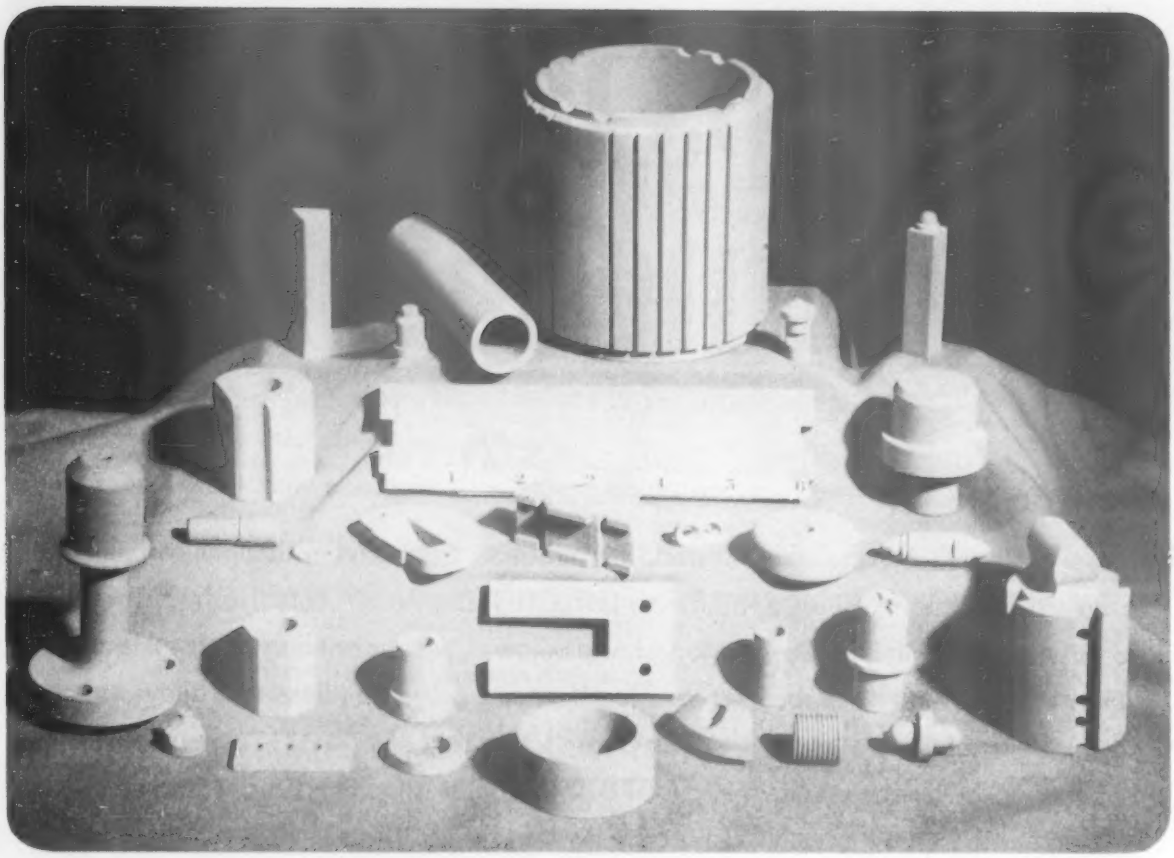

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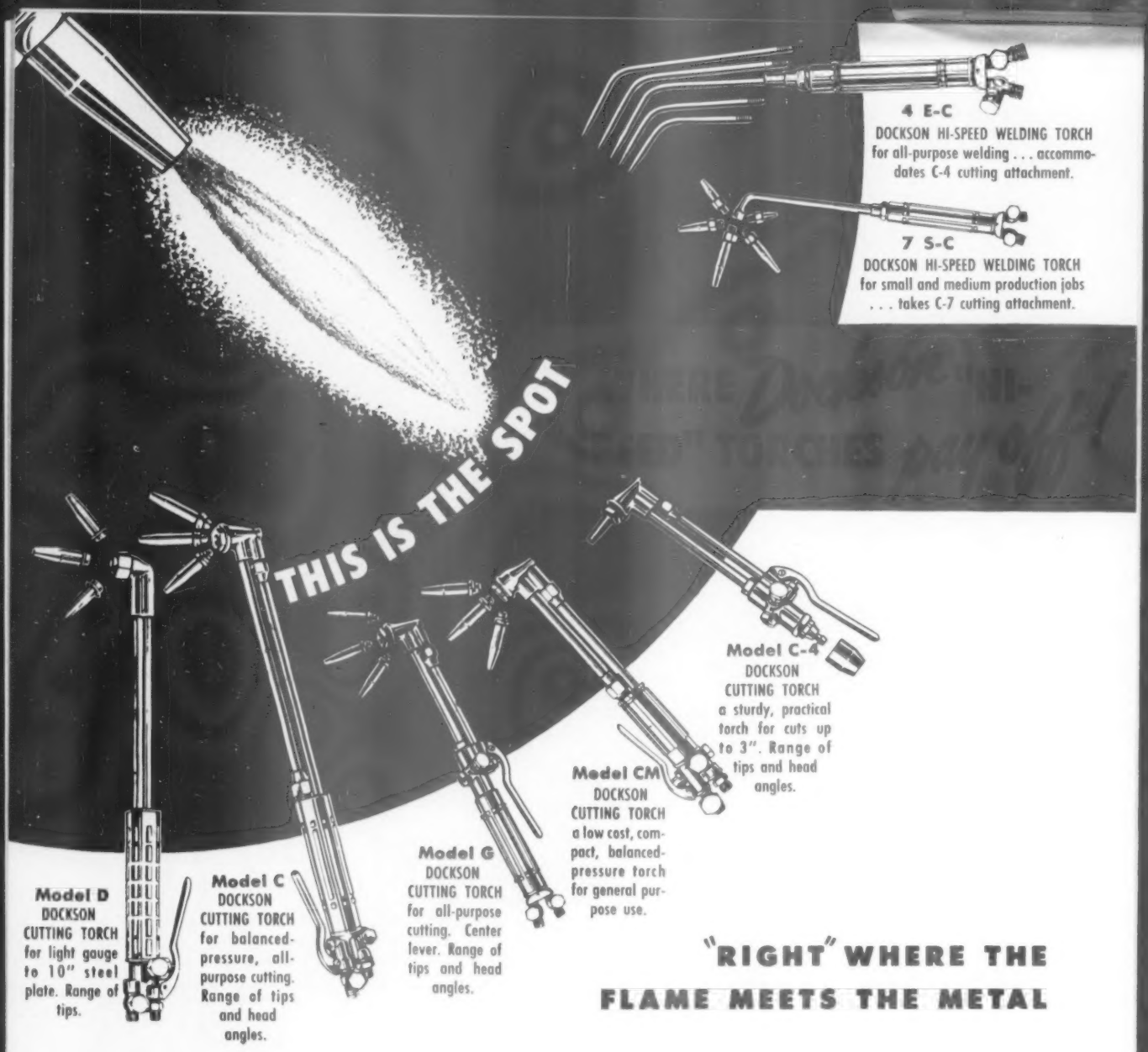
Sheet	M1 AZ31	M FS1		*47M2 *47M2			4370 {4375 {4376	51 510	B90-49T B90-49T	M1A AZ31A	QQ-M-54 QQ-M-44

*Superseded by Federal Specifications. Included because many drawings still call out these obsolete specifications. †Reprinted from the *Magazine of Magnesium*, Brooks & Perkins, Inc.



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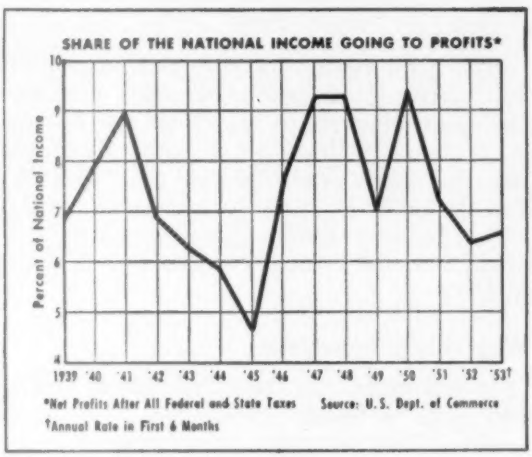
The first of two articles on profits

PROFITS...How High Are They?


SHARE OF THE NATIONAL INCOME GOING TO PROFITS*
Percent of National Income
10
9
8
7
6
5
4
1939 '40 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50 '51 '52 '53†
*Net Profits After All Federal and State Taxes
†Annual Rate in First 6 Months
Source: U. S. Dept. of Commerce

How high are profits? What is being done with them? This is the first of two articles designed solely to throw some factual light on these key economic questions.

One of the important economic developments of 1953 has been a substantial increase in the dollar volume of corporation profits from the level of 1952. But to answer the question "How high are profits?" we must also measure them: 1) by comparison with the record of previous years, and 2) as a share of the total national income. The term "profits," as used here, refers to profits *after taxes*. These are the only profits that can be paid to stockholders or retained for use in the business.

In the first six months of 1953, corporate profits *after taxes* were at an annual rate of $20.4 billion. This was higher than in the first half of 1952, but lower than in the full years 1948 or 1950, or in the first half of 1951. If allowance is made for the declining value of the dollar, this year's net profits for all corporations represent less purchasing power than those made five or six years ago.

Here is the record of profits over the years:

	Net Profits After Taxes of All U. S. Corporations	
	Billions of Dollars	
	Actual	In 1953 Prices
1929	8.4	14.6
1939	5.0	9.8
1947	18.5	22.1
1948	20.7	22.7
1949	16.3	18.3
1950	22.7	24.6
1951	20.1	19.7
1952	18.6	18.7
1953*	20.4	20.4

*Annual rate, first six months

The record shows that real profits have a little more than doubled since 1939. This increase, however, does not mean that corporations are doing exceptionally well. The entire national income has doubled since 1939. And our industrial plant is more than twice as large as it was in 1939. Therefore, profits have just about kept pace with industrial growth.

Return on Investment

How high are profits compared with sales, or compared with the stockholders' investment?

What is the rate of return to the people who have invested their savings in corporate business?

The table below shows that for the past three years the rate of return on both sales and investment has been substantially below the return achieved in earlier postwar years. The rate of return on stockholders' investment is higher now than it was in 1939. But this is primarily because today's profits are reported in terms of today's prices, whereas much of the investment in plant facilities is still carried on the books at prewar prices, which are substantially below the cost of replacement. The current rate of return, measured as a percentage of total corporate sales, is below prewar levels.

	Corporate Profits After Taxes	
	Per Cent of Total Sales	Per Cent of Stockholders' Equity *
1929	6.1	NA
1939	4.1	4.0
1947	5.3	
1948	5.3	
1949	4.4	14.8 average
1950	5.3	
1951	4.1	11.8
1952	3.6	10.3
1953#	3.7	10.8

* Manufacturing corporations only
NA Not available
Annual rate, first six months

In considering these figures, it should be remembered that they are averages for all corporations. Some companies make more than the average, and many make no profit at all. In every year since 1915 at least 25% of all corporations have operated at a loss. In 1939, 58% of all corporations were losing money. This year the figure will probably be at least 30%. The improvement since 1939 shows a much healthier economy. But it does not indicate that profits are easy to make.

How Big a Share of the Pie?

The most important single fact about profits is that they now represent a *smaller* share of national income than they have in past years of normal prosperity. For the past three years, profits have taken a smaller share of the pie than in 1939, and considerably smaller than in the early postwar years. Here, as the chart at the beginning shows, is the record:

	Corporate Profits After Taxes as a Percentage of National Income
1929	9.6
1939	6.9
1947	9.3
1948	9.3
1949	7.5
1950	9.4
1951	7.2
1952	6.4
1953*	6.6

*Annual rate, first six months

The main reason for the declining corporate share of national income is, of course, the increasing share taken by the federal government in the form of taxes. The wage earners' share is also higher than in 1939. But the really startling increase is in federal taxes. Taxes on profits now equal almost 8% of the national income, compared to only 2% in 1939.

Why This Is Important

It is important that these facts about profits and taxes be widely understood. At its next session, Congress must consider what to do about the emergency taxes on profits enacted after the outbreak of the Korean War. The so-called excess profits tax is scheduled to die on January 1, 1954. In the absence of new legislation, the rate of the corporate income tax will drop from 52% to 47% on April 1. Many factors, including the revenue needs of the government, must enter into the decision whether or not to reduce taxes. But one fact stands out clearly: By comparison either with past years or with the total national income, corporate profits today are relatively low.

* * *

The second article in this series will discuss what corporations do with their profits.

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This joint must carry water at 500°F and 1600 p.s.i.

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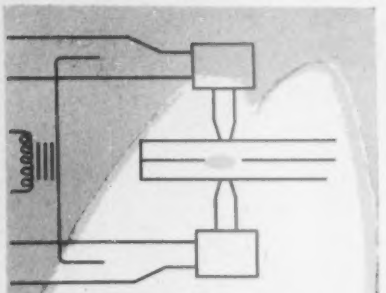

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TAILOR FOR TRACTORS

(Continued from page 27)

pictured in photo 5. The man whose hand is resting on it is Harry Faris, foreman of the welding department. Faris directs the work of nine weldor-tailors who do remodeling jobs on earthmoving machinery. Their tools include:

Three 300-amp d-c welders; three 300-amp engine-driven portable welders for field service; a 600-amp automatic welding machine that includes a motor-driven positioner; flux-grinding equipment; a pantograph-type flame-cutting machine and twelve portable oxyacetylene outfits (trucks, cylinders, hoses, regulators, welding and cutting torches).

Jobs for Submerged-Arc

Other shop equipment includes a 300-ton hydraulic press, drill presses, two portable air grinders, a bench grinder and a cut-off saw that uses abrasive cut-off wheels up to 20 in. in diameter.

The machine that gets the heaviest service in the welding department is the submerged-arc welding head (photo 6). It is used both for welding and for rebuilding jobs on such parts as idler wheels and tractor rolls. In photo 6, this automatic equipment is welding grouser stock to track pads. The workpieces, about 6 ft long, are held on a special Shepherd-built table. When circumferential welding is to be done, the table is moved out of the way, and in its place is put a mandrel (equipped with variable-drive motor and worm gear) to rotate the work.

Besides idler wheels and tractor rolls, track rails can also be built up to original dimensions by means of this automatic equipment. The rails are first dismantled into four equal-size sections. Each track is then built up with five passes for width and one pass for depth.

Another job for automatic hardfacing is to restore ripper teeth to better-than-new condition. Each of these big teeth is built up to size with metal of the same composition and then given a hardfacing layer of tungsten carbide on areas previously marked out with chalk for the weldor's guidance.

Besides hardfacing ripper teeth, Shepherd also installs a specially designed ripper on crawler-type tractors (photo 7). The ripper is welded (mostly by submerged-arc) from plate and structural shapes and attached to the tractor's hydraulic loader. In photo 7, arc welding is being done on the drawbar. Ripper teeth 1½ by 3 by 18 in. will be inserted through the holes of the transverse bar, which is hydraulically raised and lowered. At the opposite end of the tractor in photo 7 is a 1½ cu yd loader bucket, also arc welded from formed plate.

Does such tailoring service for tractors pay? One answer may be that Shepherd Tractor & Equipment Co. now has seven branches scattered throughout Southern California in addition to its 6½-acre plant site in Los Angeles.

RUSSIAN WELDS

(Continued from page 34)

The inside of the part shows signs of lengthy immersion in salt water. It is also crash damaged; otherwise the steel is in perfect condition.

Here's a Bad Job

Very poor gas welding appears upon a mild-steel rod 42 in. long (photo 7). This rod is part of the control system on elevators or ailerons. The welds have both pinholes and high spots, easily found upon close examination. The high spots appear to have been caused by the weldor not having the part in a revolving jig. Not being a good weldor, he would have to stop and reset the part when he came to the perpendicular side.

An engine cooler from a Yak 9 revealed excellent soldering craftsmanship when examined closely. The edges of the lead-tin alloy were bonded and tapered neat and clean.

Even though metal-arc welding runs a poor second to oxyacetylene welding on Russian aircraft, the metal-arc welding on aircraft shows vast improvement over the arc welding seen on the T-34 tanks at Aberdeen Proving Ground.*

No doubt the Russians have many reasons for their extensive use of gas welding. To us, the end products do not warrant the amount of labor required. However, their welding holds together, which may be all that it is supposed to do.

*"Welding Is Crude on Russian Tanks," The Welding Engineer, December, 1952, page 50 et seq.

Here's the NEWEST ADDITION to Worthington's welding positioner line

It's the new, heavy-duty precision welding positioner with the 7 features you've always wanted in one unit

1. PRECISION GEAR AND PINION DRIVE for accurate adjustment and minimum backlash. Self-locking worm reducer provides safety factor in case of power failure. All gears are machine-cut.

2. SPECIALLY-DESIGNED VARIABLE SPEED DRIVE provides stepless speed change from zero to predetermined top speed.

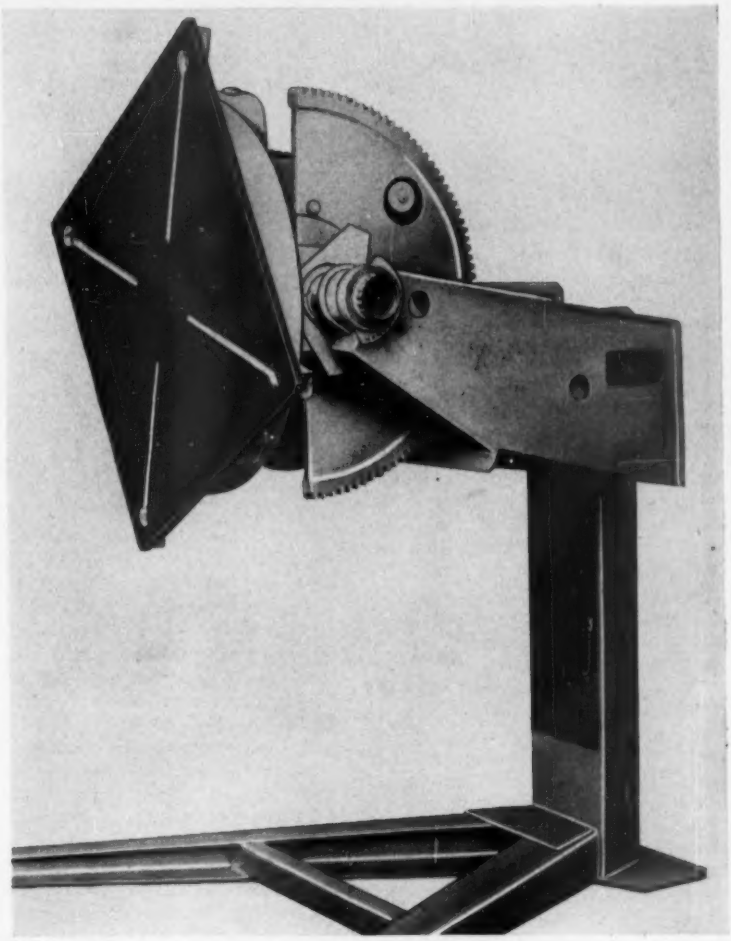
3. FAST-MOVING TILT TABLE with tilt indicator for accurate location of work at the best welding angle.

4. BUILT-IN HIGH-CAPACITY GROUND giving resistance-free return of welding current results in more uniform welds.

5. SPHERICAL SELF-ALIGNING YOKE BEARINGS eliminate misalignment.

6. HEAVY-DUTY FABRICATED STEEL POST, machined on front surface for easier raising and lowering of positioner. Positioner can be mounted on your column or wall by removing standard post.

7. MAGNETIC REVERSING STARTERS and push button controls provide for both rotation and tilt drives.



See these at the National Metal Exposition, 2111 Upper Exhibition Hall, Cleveland Public Auditorium, Cleveland, Ohio.

Y.3.4

The new Worthington positioners come in 2500, 3000, and 6000 lb. capacity sizes. Get more facts by sending the coupon to Worthington Corporation, Section Y.3.4, Plainfield, New Jersey.

WORTHINGTON

WORTHINGTON CORPORATION

Section Y.3.4 **Plainfield, New Jersey**

I'd like to know more about your new welding positioner.

☐ Please send me one of your bulletins.

☐ Have one of your sales engineers call on me.

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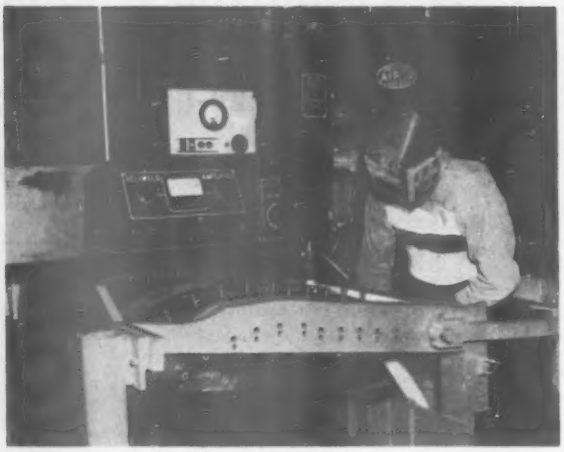
on the job

NICKEL-BASE alloy rod is applied to a cracked or chipped bottle mold by means of an oxyacetylene torch



TUNGSTEN inert-gas welds are made to follow peaks and valleys with new equipment at Ryan Aeronautical

Bottle Molds Repaired

CAST-IRON bottle molds that develop chips or cracks can be repaired without preheating by applying an oxyacetylene welding process.

In this job, as described by Wall Colmonoy Corp., Detroit, the area to be repaired is first ground to provide a bright metal surface. When cracks develop in a mold, they are chiseled or ground to the root of the crack to assure that all the oxide is removed. The groove should be of sufficient width to permit entry of the flux and welding rod.

If a mold is chipped, the area around the chip is ground to remove the oxide and produce a bright base metal. Where flaws develop, sufficient metal is removed to provide a sound, clean metal surface on which to weld.

After grinding has been completed, the area is heated to about 200 F with an oxyacetylene torch. A small amount of ferrous flux is next applied to the area, and heat is applied until the flux flows. No more of either heat or flux should be applied than is necessary to provide an effective bond. In the final step (photo at left), a nickel-base alloy in rod form is applied with a reducing flame (a feather about twice as long as the inner cone). In addition to nickel, the alloy also contains chromium and boron.

The alloy has a 2,100 F melting point. It is said to offer good corrosion resistance, fair abrasion resistance and good machinability. The use of minimum heat throughout the entire process is said to avoid fusion of the cast iron and consequent formation of hard spots adjacent to the weld.

After the weld is completed, it is finished by grinding or filing.

* * *

Tig Contour Welding

NEWEST production tool at Ryan Aeronautical Co., San Diego, Calif., is a welding machine that welds around corners or up and down hill (right photo). With unerring accuracy, this Ryan-assembled equipment makes tungsten inert-gas welds automatically over irregular surfaces. The welding electrode follows the peaks and valleys of the contour with greater precision than human hands could achieve.

In use, the operator simply clamps a large, irregular part (such as a stainless steel afterburner nozzle) in the machine and trips a few buttons. The welding head moves horizontally along the seam, fusing the metal and depositing filler wire as it goes. At every irregularity in contour, the electrode head instantly raises or lowers so that a constant arc is maintained.

In design, the machine is composed of three major assemblies. These are: (1) the welding head, (2) a side-beam carriage and (3) a large steel frame.

(1) The outstanding feature of the welding equipment is its floating electrode head that responds immediately to change in arc voltage. Two small electric motors raise or lower the head whenever the arc is lengthened or shortened by passing over irregular contours.

(2) The side-beam carriage rolls back and forth on bearing rollers, which are attached to a horizontal 12 by ¾ in. steel plate. An electric motor drives the carriage assembly through a gear and rack on the rear of the plate. By setting a dial for required feed speeds, this mechanism will maintain a precise speed. An electronic control eliminates any variations in speed and assures smooth action. The welding head is mounted on the side-beam carriage.

(3) The large steel frame is attached to threaded steel shafts inserted in steel vertical columns. The side-beam carriage is mounted on this frame. By push-button control, the operator actuates another electric motor, which turns the threaded shafts through a chain drive to raise or lower the entire assembly. An adjustment ranging between two and five feet from the floor can be made.

For each production part, Ryan builds a steel holding jig that secures the assembly with pneumatic clamps.

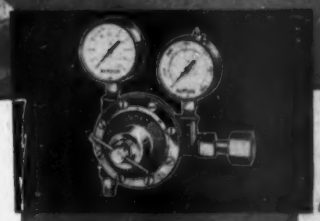
Such jet-engine structures as afterburner nozzles and exhaust cones are typical of parts welded with the new tool. Welding speeds as high as 100 ipm (three times as fast as manual welding) are being attained.

The idea of adapting Tig welding equipment to automatic contour welding was conceived and outlined by Ray Ortiz, manifold production superintendent of Ryan Aeronautical Co. Plans for the machine were developed by C. C. Hasty, design engineer.

which PRODUCT Is Best?

which PROCESS Is Best?

ASK MR. X



Avoid Guesswork and Delay

Mr. "X" is not one individual—rather he represents the collective experience and "know-how" of Burdox welding men. This "know-how" is the result of years of working in close harmony with companies having all types of welding problems — using all types of equipment on all types of jobs. Mr. "X" is not partial to any particular welding process . . . he is an expert in all of them and therefore in a position to suggest the best possible products for your particular needs.

When you buy Burdox you not only get the finest welding and cutting equipment that money can buy, but you engage the services of our Mr. "X". He will work with your workers . . . increase your output and stretch your welding dollar!

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"Shortstub" ELECTRODE HOLDER

The jaws substitute for stub waste by splicing a 2 inch extension to the length of every electrode.

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MODERNIZE the fabrication of plates, shapes, rods, bars, pipes, etc. MAKE fitting, positioning, holding, and welding a fast, accurate, inexpensive, one-man job.

"Multi-Pic" CONTOUR CLEANER

Delivers FIVE surface cleaning blows with each swing and lasts FIVE times longer than single headed hammers.

HAS 5 CONTOUR FORMING HEADS WHICH MEANS 5 TIMES FASTER CLEANING ACTION.

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American Wheelabrator & Equipment Corp.

Automatic Weld Cleaning

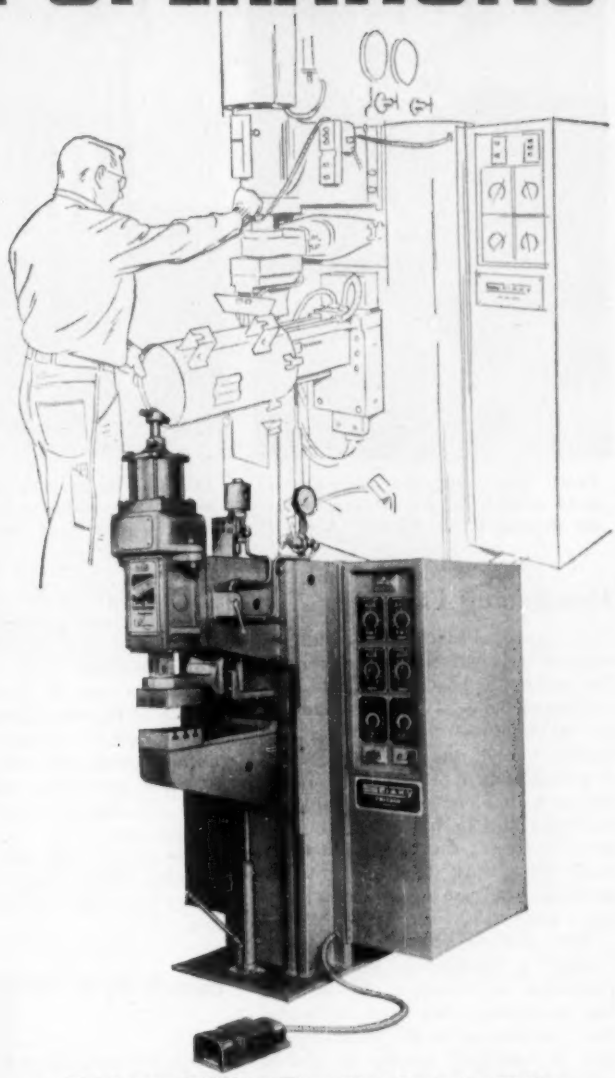
MANY manufacturers have found that airless abrasive blasting does a good job of removing mill scale, flux and spatter from steel weldments. Such was the case at Irrigation Equipment Co., Inc., Eugene, Ore., manufacturer of couplers and fittings for sprinkler irrigation.

The problem was to clean scale, flux and spatter from welded fittings and adapters in preparation for hot-dip galvanizing or bright-zinc electroplating. The weldments, of 14-gage metal, were from 2 to 6 in. in diameter and from 6 to 24 in. long. Some were straight tubing and others were in the form of elbows. They had nipples and certain other pieces welded to them and weighed from a few ounces up to 15 lb.

Sandblasting was found to be too slow for the production of the shop. Then a machine was installed to do automatic airless blasting. This machine has a cleaning compartment formed by a continuously moving endless rubber belt of the apron type. The belt passes through the blasting compartment and assumes the shape of a trough at the bottom. It draws the parts up from the bottom and cascades them gently over the top of the load, where they are subjected to an avalanche of steel shot. Shot with a nominal particle diameter of 0.017 in. is thrown centrifugally from a rotating bladed wheel mounted in the roof of the blasting compartment.

A batch of parts is blasted for only ten minutes, then automatically unloaded from the machine. The operator simply sets a tote box in front of the machine, opens the door and actuates buttons to reverse the direction of motion of the conveyor belt. The action of the conveyor draws the parts out of the blasting chamber and discharges them into the tote box, to be carried to the next operation.

SEVEN DIFFERENT PRODUCTION OPERATIONS ON ONE STANDARD WELDER



*Sciaky type PMCO 2T Three-Phase Projection Welder joins seven different parts to Moloney Transformer Tanks. A two-switch foot pedal provides immediate selection of preset heat and pressure sequences for different welds without removing tank from welder or stopping production to reset controls.

Versatile Sciaky Standard Three-Phase Projection Welder Sharply Reduces Tooling Costs

With typical efficiency, Moloney Electric Company uses a minimum number of Sciaky machines for a maximum number of welding operations.

After careful study, Moloney found Sciaky electric resistance welding offered many advantages over other methods of fabrication. Sciaky patented Three-Phase principle of operation provided automatic compensation for variation in material thickness, piece-part configuration, and fit-up to improve weld quality and machine versatility.

Only Sciaky Three-Phase characteristics of balanced line load, high power factor, and 75% current reduction permitted such extensive use of resistance welding with existing power supply.

Now Moloney pressure-tight transformer tanks, from 10" to 30" in diameter, and 21" to 54" in height, are fabricated almost completely on Sciaky Three-Phase welders.

For complete details on the efficiency and economy of Sciaky resistance welding at Moloney, write for "Resistance Welding at Work", Volume 3, No. 7.

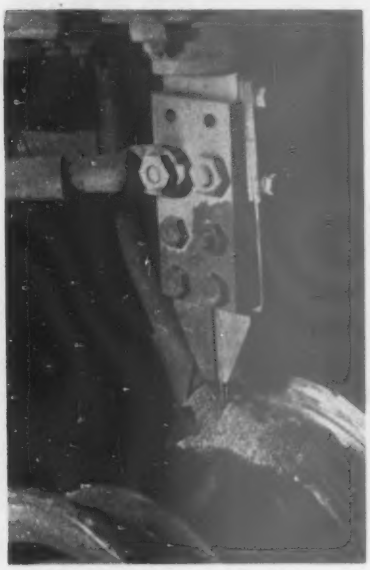
Largest Manufacturers of Electric Resistance Welding Machines in the World

SCIAKY

4915 WEST 67th STREET, CHICAGO 38, ILLINOIS

Plants: Chicago • London • Paris Sales Offices: Chicago, Ill. • Buffalo, N. Y. • Cleveland, Ohio • Dayton, Ohio • Detroit, Mich. • Ft. Worth, Texas • Hollywood, Calif.• New York, N.Y. • Philadelphia, Pa. • Washington, D.C.

New Products . . .



FLUX supplies alloy content of weld deposit in hardfacing method developed by Lincoln Electric

LOW-inertia head enables this new bench spot welder to join copper or nichrome wires of very light gage

ULTRAWIDE current ranges for all types of welding are offered in a new selenium-rectifier welder line

Hardfacing Fluxes

THE Lincoln Electric Co. has developed an entirely new technique for automatic hardfacing. The alloy content of the weld deposit is supplied by an agglomerated granular flux rather than by the electrode. Now it is possible to apply automatic hardfacing with a conventional mild-steel electrode simply by substituting the new hardfacing flux for the flux normally used. Any standard automatic welding head may be used without any changes.

This product makes it possible to "tailor" a hardfacing deposit to a particular requirement. By diluting the hardfacing flux with mild-steel flux, properties of the weld deposit can be matched exactly to service specifications.

Two hardfacing fluxes are available. Flux "H-545" is to be used whenever a good abrasion resistance and high impact strength are required. The weld metal is an alloy of carbon, manganese, silicon, chromium, molybdenum and vanadium. The deposit is magnetic at room temperature and, with recommended procedures, has a consistent hardness of 53-57 Rockwell C.

Flux "H-550" is used when deposits extremely resistant to abrasion but with good impact strength are wanted. The weld metal is an alloy of carbon, manganese, silicon, chromium and molybdenum. The deposit is magnetic, semi-austenitic at room temperature and non-machinable. A broad hardness range from 36 to 62 Rockwell C can be developed.

Both of the new fluxes can be used with a medium to high carbon electrode as well as with a mild-steel electrode, extending still further the range of service requirements that can be met.

The new fluxes are available in standard 100-lb bags.

THE LINCOLN ELECTRIC CO., Cleveland 17.

* * *

Bench Spot Welder

(center photo)

SPECIFICALLY designed for the joining of light-gage metals and wire, a new electronically controlled spot welder is said to assure successful welds on copper and other materials generally considered impractical for spot welding. The manufacturer claims it is able to fuse two 0.0008-in. copper or nichrome wires.

The trick is said to be an extremely low-inertia head. The electronic control unit operates on the capacitor discharge principle. It stores a preset load of energy that produces a measured amount of heat at the proper point of the welding cycle. Maximum energy storage is 80 watts per second; minimum 0.2 watts per second. Maximum discharge rate is approximately 120 kw.

The unit, known as "Model 1015 Unimatic Weldmaster," is 18½ in. high, 9 in. wide and has an overall length of 22 in. It weighs 35 lb. It has a maximum throat opening of 6 in.; minimum of ⅛ in. A simple adjustment increases the opening beyond 6 in. The welding force is adjustable from 2 to 25 lb. The power line demand is 500 watts.

UNITEK CORP., 275 N. Halstead Ave., Pasadena 8, Calif.

Rectifier Welder

A SELENIUM-rectifier welder line just announced by Miller Electric Mfg. Co. offers ultrawide current ranges for all types of welding. Ranges for the several welder sizes are "SR-200" (3-300 amp), "SR-300" (3-400 amp), "SR-400" (5-525 amp) and "SR-600" (125-750 amp).

Other features include: (1) a time-tested pulsating direct current, (2) magnetic-amplifier circuit and new current-stabilizing coils to insure complete arc stability, (3) hand or foot remote-control units that permit crater elimination and micrometer amperage selection and (4) new range-selector switch and dual "Unitized" infinite current controls.

MILLER ELECTRIC MFG. CO., Appleton, Wis.

Bench Welder

THE new Raytheon "ILS" Weldpower head replaces the former "G" model. It is designed for use with the Model 225A control. Press type and foot-operated, the small bench welder is equipped with accurate pressure and follow-up controls, as well as a visual pressure scale. The lower electrode may be used on a vertical or horizontal plane.

RAYTHEON MFG. CO., Waltham 54, Mass.

* * *

Mig Filler Wire

WELDWIRE CO. has developed precision spooling of many types of filler wire for Mig (metal inert-gas) welding. Now available in spools are aluminum, stainless, non-ferrous alloys and mild-steel filler wires.

This "Weldspool" wire is delivered in sizes from 0.015 to 0.250 in. on standard-size expendable spools. These spools are adaptable to all kinds and all makes of automatic and semi-automatic machines. The wire is chemically and mechanically cleaned prior to spooling. It is prepared to rigid specifications, which permits a smooth and continuous feed.

WELDWIRE CO., INC., Emerald and Hagert Sts., Philadelphia 25.

* * *

Leather Safety Gloves

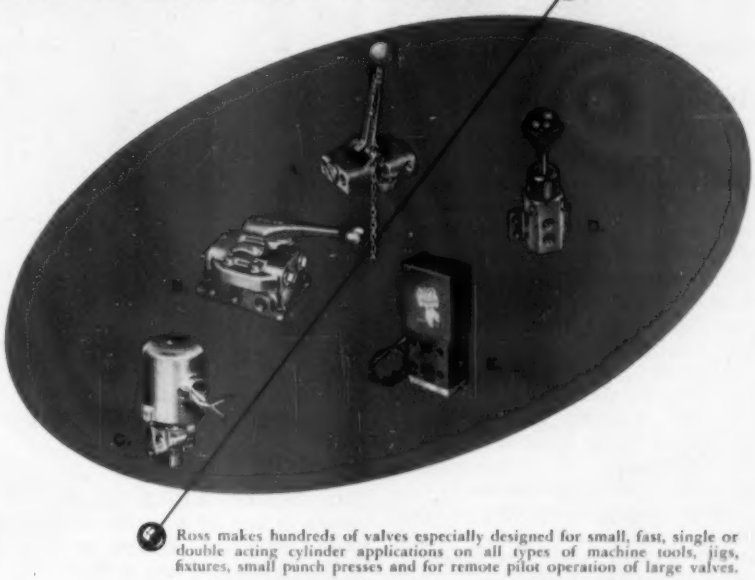
ALL-LEATHER, heat resistant safety gloves are said to give the wearer full sense of touch and dexterity. Though these gloves are not bulky or stiff as are most asbestos gloves, they are able to resist temperatures up to 800 F, the manufacturer states.

The "Liberty" gloves are said to be from five to 15 times more durable than ordinary types of heat gloves. Of smooth finish, the new gloves are made with extra-long fingers to allow for shrinkage during use.

HEAT-RAY SAFETY LEATHERS, INC., 22 W. First St., Mount Vernon, N. Y.

IF IT'S A VALVE
FOR WELDING—
ROSS HAS IT

SMALL *Ross* VALVES
SOLVE CONTROL PROBLEMS



Ross makes hundreds of valves especially designed for small, fast, single or double acting cylinder applications on all types of machine tools, jigs, fixtures, small punch presses and for remote pilot operation of large valves.

A. 600 series—three-way or four-way—hand and foot—¼" pipe—horizontal or vertical handle—single or double treadle.

B. 880 series—three-way or four-way—hand and foot—¼" and ⅜" pipe—horizontal or vertical handle—single or double treadle.

C. Inline direct operated solenoid — straight-way and three-way — normally open and normally closed —⅛" pipe.

D. Straight-way or three-way normally closed — ¼" pipe — various heads.

E. Four-way direct operated solenoid—¼" pipe—can be converted to three-way by plugging cylinder port.

Large or small—Ross has the most complete line of operating valves in the industry. Ask Ross for any air control information.

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OPERATING VALVE COMPANY
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Engineers at Your Service in all Principal Cities

Improved Ignitrons

AFTER nearly two decades, a major improvement has been effected in ignitron mercury-pool tubes for resistance-welding controls. The improvement is a new temperature control that is designed to effect savings up to 95% in cooling water. It also protects the tubes and the welding transformer and electrodes against over-loading and overheating.

The tubes are types GL-6346 (Size B), GL-6347 (Size C) and GL-6348 (Size D). Basically, they are standard mercury-pool ignitrons and will directly replace all corresponding ignitrons in welding controls.

Main components of the new temperature-control unit are two snap-acting switches, which are mounted on a constant-length reference strip. One switch operates a solenoid valve in the water supply. This maintains the proper amount of cooling water as required by operating conditions. The other switch, set to operate at a few degrees higher temperature, cuts off power to the tube in the event of overloading or overheating.

The new temperature control is said to eliminate water-flow relays, water over-temperature relays and water-pressure interlocks.

GENERAL ELECTRIC Co., Electronics Park, Syracuse, N. Y.

* * *

Cleaning Tissues

THESE chemically-treated cleaning tissues for goggles, welding lenses, etc. are said to prevent fogging. The manufacturer states they will not scratch the finest glass. These large-size tissues are strong, soft and durable, and each can be used several times.

The "No-Fog" cleaners are also said to clean grease and grime from glass.

CARHOFF Co., 11706 Kinsman Rd., Cleveland 20.

Special Welding Studs

NEW studs for concrete anchoring applications have been developed by Nelson Stud Welding Div. Cold-drawn steel with a tensile strength of 75,000-85,000 psi is used in the new fluxed anchor studs. They are welded in the angle or on the faces of steel members. Special accessories are available to insure accurate alignment.

NELSON STUD WELDING DIV., Gregory Industries, Inc., Lorain, O.

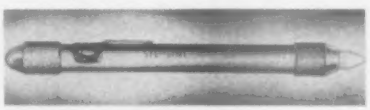
* * *

Projection Welder

THE Sciaky EPT-2 projection welder is one of a series of three-phase projection welders available in 50, 75 and 100 kva at 50% duty cycle. It can be supplied in 12, 18 and 24 in. throat depths and a maximum electrode force of 4,000 lb. It can be supplied as a combination projection and spot welder, the ESPT. The latter will spot weld two thicknesses of mild steel in minimum gages of 0.020 in. and maximum gages of 0.203 in.

SCIAKY BROS., INC., 4915 W. 67th St., Chicago 38.

* * *

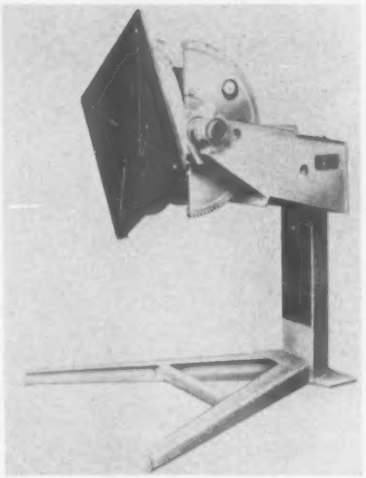


Soapstone Holder

A HOLDER resembling an automatic pencil has been developed for soapstone. The product has an automatic locking device to make the soapstone adjustable to any length for different marking conditions. It weighs only 3 oz and has a clip attached.

The holder is said to practically eliminate soapstone breakage.

SEE-LINE Co., INC., 618 Amarillo Building, Amarillo, Tex.



Heavy Positioners

A VARIABLE-speed drive features three new heavy-duty precision positioners offered for either automatic or manual welding. These new units are built in 2,500, 3,000 and 6,000 lb capacities.

The drive is of the differential type, with all components mounted on ball bearings. It provides stepless speed changes from zero to the predetermined top speed. Speed changes can be made either by a calibrated hand wheel or by remote control.

The table is driven by a spur gear and pinion, which is said to provide minimum backlash and accurate adjustment. A high-capacity ground is built into the positioner. This is said to give resistance-free return of the welding circuit and help produce more uniform welds.

The table can be tilted 135 deg in 40 seconds. The height of the table is adjustable in 6-in. steps. A tilt indicator for accurate location of pieces at the best working angles is standard equipment.

WORTHINGTON CORP., Harrison, N. J.

* * *

Anti-Wear Aid

A HARDFACING as "thin as skin" can be had by using a new instant overlay, "KR 6900," according to the manufacturer's claims. The new product comes in both powder and paste form and can be painted on the metal surface. After application of the torch or carbon arc to melt the paste, the product bonds to the metal to form a film of wear-resistant hardfacing.

Successive applications can be used to create a thicker film. The product comes in packages of 2 lb and 5 lb.

EUTECTIC WELDING ALLOYS CORP., Flushing, N. Y.

Viking

THE WELDERS WITH GREATER ARC STABILITY !

- INERT-ARC
- AC METAL-ARC
- DC RECTIFIER
- RAD-ARC-TROL

INERT-ARC WELDER—Combines instant starting, smooth and stable arc, compactness, and portability.

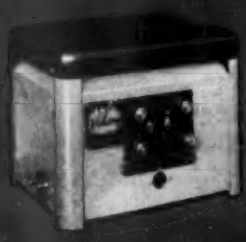
AC METAL-ARC WELDER—Patented design features high duty cycles without cooling fans, minimum "no-load" loss, smooth and stable arc. Available in models from 130 to 600 amp capacity.

DIRECT CURRENT SELENIUM RECTIFIER WELDERS—The latest development in direct current welding equipment. No moving parts—low maintenance.

Viking—the name synonymous with welding know-how—gives you a PRODUCTION ENGINEERED welder line for all your needs.

Viking welders—famous for their smooth, STABLE arc—are tops in performance under all conditions. Carefully designed—ruggedly built—rigidly inspected, Viking welders do the job economically and effectively.

Viking engineers and distributors are well qualified to assist you in determining the right equipment for your jobs—or in converting your present equipment to high-frequency or Inert-arc welders.



RAD-ARC-TROL—An automatic high-frequency arc starter and stabilizer for use on ANY MAKE of AC or DC welder. Model MR is used for light gauge metallic-arc welding. Model MRG converts your present welder to the Inert-arc Process. The gas regulating attachment is included in the unit.

WRITE FOR COMPLETE INFORMATION ON ALL VIKING WELDERS

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"THAT TAYLOR-WINFIELD OUTFIT CAN GIVE US SOME REAL HELP"
"THEIR FIELD MEN WILL SERVICE THE EQUIPMENT"
"THEY WILL ENGINEER THE WELDERS INTO OUR PRODUCTION SET-UP"
"THEIR APPLICATION ENGINEERS WILL SHOW US THE BEST WAY TO RESISTANCE WELD THESE PARTS"
"THEY'VE ALWAYS BEEN KNOWN AS THE QUALITY COMPANY IN RESISTANCE WELDING"

IF YOU HAVE a production joining problem, bank on resistance welding and use the facilities of Taylor-Winfield. We have sales and application engineers who spend their time on specific customer projects.

If you will outline your needs, we will give you some practical help. T-W specializes in shirt-sleeve assistance on resistance welding. We design, engineer and build resistance welders into your production line. For prompt attention, address your inquiry to the nearest sales office.

Sales and Service

CHARLOTTE · CHATTANOOGA
CHICAGO · CLEVELAND · DAYTON
DENVER · DETROIT · DALLAS
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SEATTLE · S. PASADENA · ST. LOUIS
WASHINGTON · STAMFORD
DUNDAS, ONTARIO

Resistance Welders Since 1898

TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION • WARREN, OHIO

Plastic Goggles

NEW welding goggles with a large lens area are said to give eye protection against sparks as well as radiation. They also offer the wearer greater visibility. The lenses are protected on both sides by acetate covers. These covers reduce pitting from sparks and eliminate danger of shattering.

Made of translucent plastic, the "No. 50" series goggles fit any facial contour. Cross ventilation is provided by four vents—two at the top, two at the bottom. Prescription glasses can be worn comfortably under these new goggles.

Lenses can easily be replaced because of a push-out construction. The lens holder on the "No. 50" series is also replaceable. Lenses with various shades of federal specification coloring are available.

DOCKSON CORP., 3839 Wabash Ave., Detroit.

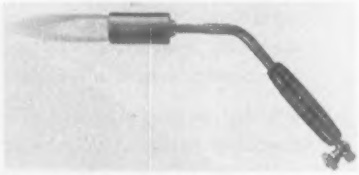
* * *

1-Ton Positioner

A 2,000 lb capacity Model C2000 has been added to the Aronson line of "universal balanced" positioners. It provides the same finger-tip positioning of all workpieces between 10 and 2,000 lb. Other models are of 500 and 1,000 lb capacities.

ARONSON MACHINE CO., Arcade, N. Y.

* * *



LP-Gas Torch

THE Ransome 81 medium-duty torch for LP-gas fuels is useful for melting lead joints, sweating large fittings, light preheating, etc. Because there is no tank on the handle, the torch may be used in very close quarters or even upside down without danger of fuel spilling. It weighs only 1¼ lb and operates 6 hours on a single gallon of LP-gas at 10 psi. It is 14½-in. long.

RANSOME CO., 4030 Hollis St., Emeryville, Calif.

PRES COTELL, shop foreman, welds ballast equalizer of a heavy duty crane. Owner Eddie O'Rourke on the right.

"ANACONDA Welding Rods help me live up to my slogan"

—says Eddie O'Rourke, owner Industrial Welding Company, Boston

"My slogan is, 'If It's Metal We Weld It'," continues Mr. O'Rourke. "My business depends on whether or not I live up to it. A good slice of our repair work calls for us to join cast and malleable iron and build up worn surfaces on castings. For this we always use ANACONDA-997 (Low-Fuming) Bronze Welding Rods. Bronze won't pull apart. From experience, we know ANACONDA-997 Rods 'tin' readily, flow freely at low temperatures, have good tensile strength. Work needs less preheating and finished welds need less machining. ANACONDA-997 Bronze Welding Rods are economical, too. They flow better, give us more welds per rod."

Anaconda Welding Rods are available from distributors throughout the United States and Canada. Industrial Welding Co. buys its rods from Whitehead Metal Products Co. in Cambridge, whose salesman is a practical welder and contributes helpful welding suggestions. Consult your Anaconda Distributor for practical advice on welding problems. For latest tips on welding techniques, write for FREE booklet B-13 to *The American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

53168

FOUR TRUCKS, mounted with welding equipment, speed Mr. O'Rourke and his crews to emergency jobs.

braze or weld with confidence

ANACONDA®

welding rods

New rectifier welder means greater welding performance . . .

RA welder pioneered by Westinghouse now provides many added advantages

Here is the *all-new* RA Welder, truly the finest, fastest and easiest, *any* position, d-c welding machine on the market. Westinghouse, the pioneer in rectifier type d-c welding equipment, has incorporated in the new welder all the engineering know-how and years of "on-the-job" welding performance needed to make the "RA" a *proved performer*. The exclusive features alone —Arc-Drive Control, Built-in Automatic Overload Protection, Single-Range Stepless Current Control— set new quality and performance standards for the welding industry.

Take the Arc-Drive Control for example: This exclusive Westinghouse feature provides an extra "push" to the metal as it leaves the electrode and moves toward the welding surface. This extra "push" assures greater weld penetration. In addition, the Arc-Drive Control enables the operator to quickly and easily adjust the arc-drive current to fit the needs of the particular job.

Another feature is the new "on-off" switch—the AB De-ion® Circuit Breaker. This circuit breaker provides positive and automatic protection against excessive overheating, yet permits harmless temporary overloads without interrupting production.

A rugged frame and a *Bonderized* sheet-steel case enclosure provide maximum protection for both indoor and outdoor operation.

Superior ventilation combines the use of natural air flow and a fan powered by a dependable, nonreversible, totally-enclosed, 1/8-hp motor with prelubricated ball bearings. Specially designed air ducts within the unit provide for free and dependable passage of cooling air—this means longer life.

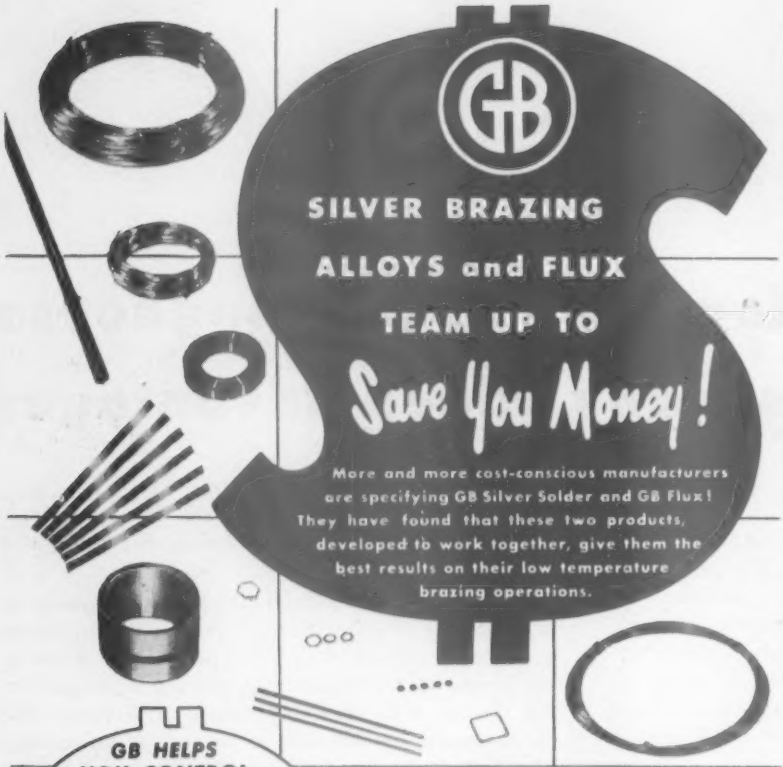
Features like these—the result of years of experience in producing rectifier welders—put the Westinghouse RA Welder ahead of other types of d-c welding equipment. Get all the reasons why the Westinghouse RA Welder is the best buy. Ask your Westinghouse representative for full details, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

COUNT ON THESE DEFINITE ADVANTAGES

- **ARC-DRIVE CONTROL** provides for greater weld penetration.
- **SINGLE-RANGE STEPLESS CURRENT CONTROL** allows infinite number of current settings with single-dial adjustment.
- **CIRCUIT BREAKER "ON-OFF" SWITCH** provides positive and automatic thermal overload protection.
- **SUPERIOR VENTILATION** affords greater natural cooling . . . longer winding life.
- **WEATHERIZED CONSTRUCTION** offers maximum indoor and outdoor weather protection against snow, rain, water and the most rugged of operating conditions.
- **QUIET OPERATION** means less operator fatigue and provides longer machine life through elimination of moving parts.

J-21835

YOU CAN BE SURE...IF IT'S Westinghouse


SILVER BRAZING
ALLOYS and FLUX
TEAM UP TO
Save You Money!
More and more cost-conscious manufacturers are specifying GB Silver Solder and GB Flux! They have found that these two products, developed to work together, give them the best results on their low temperature brazing operations.

GB HELPS YOU CONTROL THESE COST FACTORS!

SPEED
HEATING
MATERIAL
LABOR
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FIT-UP
PREPARATION

GB Silver Solders are available in six standard alloys—each developed to meet specific cost and production requirements. All are available in the most convenient form to meet your needs—wire coils or straight lengths, strips, sheets or formed pieces.

GB No. 50 Silver Solder, melting range 1160-1175°F
GB No. 50N Silver Solder, melting range 1240-1260°F
GB No. 45 Silver Solder, melting range 1125-1145°F
GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
GB No. 31 Silver Solder, melting range 1130-1300°F

And, if you require a special Silver Solder, Goldsmith's Technical Service Division is ready to give you competent assistance—their recommendations will be backed by 80 years of experience in alloying and refining precious metals.

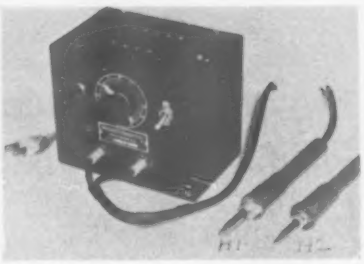
GB FLUXES

Produced under strict laboratory control, GB Fluxes are fully active, deep penetrating, stable and economical. While developed primarily for use with GB Silver Solders, they produce high quality joints with any good silver solder.

GB DATA BOOK

Here's down-to-earth information on the important phases of low temperature brazing. You can get a free copy from your GB Distributor—Write us and a copy will be forwarded to you.

GOLDSMITH BROS. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867



Soldering Set

"MODEL J-4" is a compact soldering unit designed for any type of light or heavy-duty production soldering. It comprises a power unit and two sizes of carbon electrodes with holders. The carbon electrode tips are replaceable.

An interval timer with a range of from 0 to 60 seconds is available. This timer is said to allow fast precision soldering. Accurate timing also prevents overheating and warping of the parts to be soldered. A groundplate attachment, on which jigs or fixtures may be mounted, is also available.

Some applications for which this production soldering outfit can be used are: soldering condensors, lugs, terminals, condensor cans, terminal boards, electronic instrument parts and tube sockets.

VEMALINE PRODUCTS CO., P. O. Box 222, Hawthorne, N. J.

* * *

Portable Spot Welder

A SMALL portable spot welder made in Great Britain weighs only 25 lb but is said to produce high quality welds. Only two movements are required, squeezing the toggle grip to obtain high forging pressure at the tips and depression of the trigger switch to cause the welding current to flow. Each "Spot-Gun" is supplied in a strong fitted case, complete with a range of 9 assorted heavy copper extension arms and two clamps.

C. F. CARPENTER, P. O. Box 87, Allentown, Pa.

* * *

Non-Corrosive Flux

A NEWLY developed soft soldering and tinning flux known as "Special No. 30" is said to be non-corrosive, non-hygroscopic and non-conductive to electricity. It is not recommended as a general substitute for the commonly used zinc chloride fluxes but more for those soft solder applications where rosin base fluxes are unsatisfactory and strong fluxes might cause corrosion.

THE SUPERIOR FLUX & MFG. CO., Dept. X-10, 1302 Ontario St., Cleveland 13.

MODEL 440

Introducing PENOPTIC *Protective* FACE SHIELDS

The high quality and performance of Pennsylvania Optical products throughout 67 years of ophthalmic development have been incorporated in these new face shields. The clear or green, metal-bound, acetate windows are non-pitting, flame-resistant. (Bronze fine wire mesh windows are also available.) Each model permits free passage of air about the head . . . can be worn over goggles or prescription eye glasses. Now, Penoptic's manufacturer-to-you distribution policy again offers new opportunities to save with safety.

MODEL 438

MODEL 411

MODEL 412

MODEL 425

CONSTRUCTION FEATURES

- Windows of finest optical acetate provide that extra measure of safety.
- Snap-tight fasteners permit speedy, secure attachment of windows to headgear units.
- Formed fibre crown protectors extend coverage over brow; support windows firmly.
- Disposable sweatbands of absorbent, anti-septically treated paper for new maintenance economy and improved industrial hygiene.
- Fibre headbands treated for moisture-resistance, tough, easy to clean, easy to adjust.
- Plastic sleeves cover adjustable headbands for added smoothness and comfort of fit.
- Adjustable spring tension assembly permits easy lifting of window to raised "off" position; holds securely in lowered "safe" position.

For Prices And Full Information On Complete Line Of Face Shields Write Directly To:

Order Direct and Save!

PENNSYLVANIA OPTICAL COMPANY

READING, PENNSYLVANIA

Known For Fine Ophthalmic Products Since 1886

Difficult and dissimilar metals weld more easily with AMPCO-TRODE* 10 BARE WIRE

for inert-gas consumable electrode process

GET faster welds, denser deposits, good mechanical properties ... use Ampco-Trode 10 bare wire for inert-gas consumable electrode welding... to join aluminum bronze, brass, silicon bronze, etc.

Specify Ampco-Trode 10 wire on spools or rims for (1) uniform, controlled chemical composition, (2) highest quality surface finish and cleanliness, (3) level winding that assures smooth wire feeding.

Ampco-Trode 10 bare wire gives a deposit hardness on overlays of 160-190 BHN (3000 kg. load). When higher hardnesses are needed use Ampco-Trode 160, 190-220 BHN or Ampco-Trode 200, 250-280 BHN.

Order Ampco-Trode wire and watch costs go down, weld quality go up. Call your Ampco distributor or write us now.

*Reg. U. S. Pat. Off. W-120

AMPCO METAL, INC.

Dept. WE-11

AMPCO Milwaukee 46, Wisconsin

West Coast Plant, Burbank, California

Fiber-Glass Helmet

A DROP-TEST weight that went through an ordinary welding helmet just bounced off a newly-developed fiber glass helmet. Tests made in the laboratory and under actual working conditions showed the new product was able to withstand an impact five times greater than the average helmet.

Manufacturer also states that the product is cooler, lighter in weight and will not warp. Held in a 160-deg salt solution for 48 hours, it absorbed less than ½ oz of moisture, and there was no sign of warping.

The helmet has a black crackle finish.

SELLSTROM MFG. CO., 615 N. Aberdeen St., Chicago 22.

* * *

Heating Electrode

A STEEL-CORE coated electrode that provides instant heat has been developed for spots where an acetylene torch is impractical. This electrode creates a unique type of arc. Instead of depositing the metal, it oxidizes it with a searing blast. The core metal then disintegrates into a powder that can be brushed off.

Known as "ThermoTrode," the new electrode is inserted into an ordinary holder of a d-c arc welder and is ready for such jobs as quick heating, annealing, heat treating, softening, preheating, burning off paint, etc. It is available in diameters of ⅛, 5/32 and 3/16 in.

EUTECTIC WELDING ALLOYS CORP., 172nd St. & Northern Blvd., Flushing, N. Y.

* * *

Mistproofing Cloth

"SEECLOTH", a chemically-treated cloth for simultaneously cleaning and mistproofing goggles, glasses, masks, windows, mirrors, and windshields remains effective for several months' use.

It is said to be a real safety aid, making it easy for workers to keep their goggles clean and useful while working inside tanks or boilers.

HYGIENE RESEARCH INC., 684 Broadway, New York City 12.

What are the FACTS about flame-machining gears and sprockets by Cogmatic method?

Q. First, what *is* the Cogmatic method?

A. At long last, a practical means of flame-machining gears and sprockets, with far greater speed and economy than is possible with machine tool methods.

Q. What's *different* about the Cogmatic method?

A. For the first time, Cogmatic offers you a moderately priced, compact, flame cutter, capable of machining gear shapes to ± .015", diameters from 3" to 120".

Q. What production advantages does "Cogmatic" offer over "cold machining"?

A. Some of its many advantages include:

a) machines tough, hard, alloy steels as fast as mild steel.

b) machines over 300 shapes and sizes of teeth, including forms that *cannot* be economically produced by machine-tool methods.

c) machines up to 3 times more tooth metal per hour than machine-cutting methods.

d) water quench can be used to automatically case harden while you cut.

Q. Where are these advantages especially important?

A. A typical example is in producing chain sprockets for high speed applications. However, Cogmatic advantages apply to *all* toothed shapes cut from plate steel.

FOR PROOF

that Cogmatic can earn profit for you, return this ad with your name and company address to . . .

C-7

COGMATIC CO.

1330 NORTH FRANKLIN PLACE

MILWAUKEE • WISCONSIN

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't waste productive space storing steel!

WHEN YOU BUY STEEL FROM WAREHOUSE, YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

You can turn your present steel storage space into profitable production space—without danger to the continuity of your steel supply. Just use a U. S. Steel Supply warehouse as your own. U. S. Steel Supply can deliver the steel you want to your plant or job site at whatever time you desire. Ask your U. S. Steel Supply salesman to arrange delivery of your steel at *your* convenience—and you'll find your steel arriving with timetable dependability.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

For Welding and Cutting . . .

NATIONAL CARBIDE

in the red drum

HIGHEST QUALITY
DUST FREE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

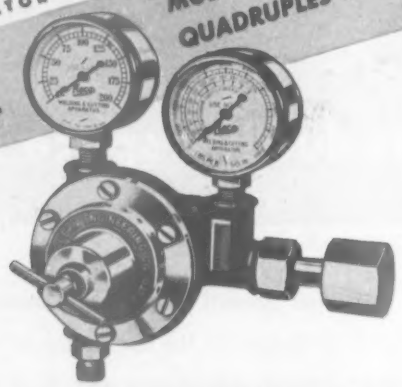
GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

Meco SAF-T-CHEK REGULATOR

MULTI-SEAT QUADRUPLES LIFE

LASTS . . . 4 Times longer



Four times the life of ordinary regulators is guaranteed by exclusive four-seat construction. Each seat may be used successively – adjusted simply. No special tools or mechanical skill is required to maintain *any* part of the MECO regulator.

SAF-T-CHEK VALVES

This exclusive MECO construction provides insurance against seat or diaphragm failure. Built-in, self-actuating SAF-T-CHEK valves prevent damage to equipment from careless handling.

BOLTED DIAPHRAGM NEVER PUCKERS

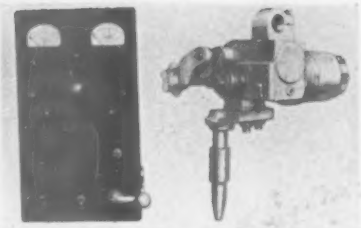
Absolutely uniform pressure and flexibility is secured by *bolting* special alloy diaphragm – instead of convertional screw fastening which puckers diaphragm fibres. Diaphragm should last the life of the regulator.

Close yoke between diaphragm and multi-seat block insures transmission and correction of tiniest pressure variations providing constant and uniform pressure.

Meco

ASK YOUR MECO DEALER FOR FURTHER INFORMATION

Modern Engineering CO., Inc.



New Welding Head

AN improved Model 944 welding head, features an electro-mechanical Col featuring an electro-mechanical control circuit. The latter stops both head and postioner automatically if the arc is broken or the electrode sticks to the workpiece. The motor drive is electrically independent of the positioner and welder power supply.

Feed rolls on the welding head are of hardened steel and adjustable for solid and tube wire and accommodate any rod size from ⅛ to ¼ in. in diameter. The feed nozzle is cast from a special Mir-O-Col alloy, said to outwear ordinary nozzles 4 to 1.

The control assembly provides a manual "inching" control, a welding voltage control, travel control of the positioner and welding current control if transformer is equipped for remote operation. The new head will operate with any positioner or transformer; its maximum current capacity is 2,000 amp.

MIR-O-COL ALLOY Co., 312 North Avenue 21, Los Angeles 31.

* * *

More Eye Room

AMERICAN Optical Co. announces a redesign in its series F200 and F300 face shields to give ⅝-in. more clearance between the wearer's face and the window. This affords more comfort to workers who must wear glasses or corrective goggles under face shields. A new patented feature on AO face shields is the floating snap fastener to permit the window to expand under extreme heat.

AMERICAN OPTICAL Co., Southbridge, Mass.

* * *

A-C/D-C Electrode

A NEW electrode for all-position welding with a-c or d-c is the Fleetweld 180. It is specially designed for occasional weldors, farmers, maintenance men, etc. The electrode was made for the low open-circuit voltage, limited input a-c welders popular on farms. It can be used to join galvanized steel, rusty, dirty or lightly-painted metals. Available in ⅛ and 5/32 in. diameters.

THE LINCOLN ELECTRIC Co., 22801 St. Clair, Cleveland 17.

Cobalt-60 Shield

A PORTABLE directional exposure shield for the safe handling of Cobalt-60 industrial radiography sources is designated the DES. Specially useful for strong gamma sources, the DES shields all radiation from the source except a beam that is directed at the area to be inspected.

The Cobalt 60 source is moved out of or into position by merely rotating a handle through 180 deg. When the source is retracted, the shield serves as a storage container. Mounted on an easily portable castered lift truck, the DES measures 3½-ft long, 2½-ft wide and 6 ft or more high.

TECHNICAL OPERATIONS INC., 6 Schouler Court, Arlington, Mass.

* * *

Brazing Flux

A NEW silver brazing flux that combines great adherence, long life and stability and meets all requirements of interim Federal specification O-F-00499 is called "Kwikflux No. 95". It retains its fluxing properties after being held at a heat of 1,300 F for 10 minutes. It is recommended for use with any standard silver brazing alloy or hard solder in the 1,000 to 1,700 F application range.

SPECIAL CHEMICALS CORP., 30 Irving Place, New York City 3.

* * *

Silicone Weld-Backing

MADE from "bouncing putty", a new G-E silicone weld-backing compound is now available from G-E welding distributors. It is said to promote uniform penetration and to eliminate the harmful effects of air on the underside of welds. It is similar to paint in appearance and is applied with a brush to the back of the joint in a ½-in. wide strip. A pint is said to cover 1,300 linear feet.

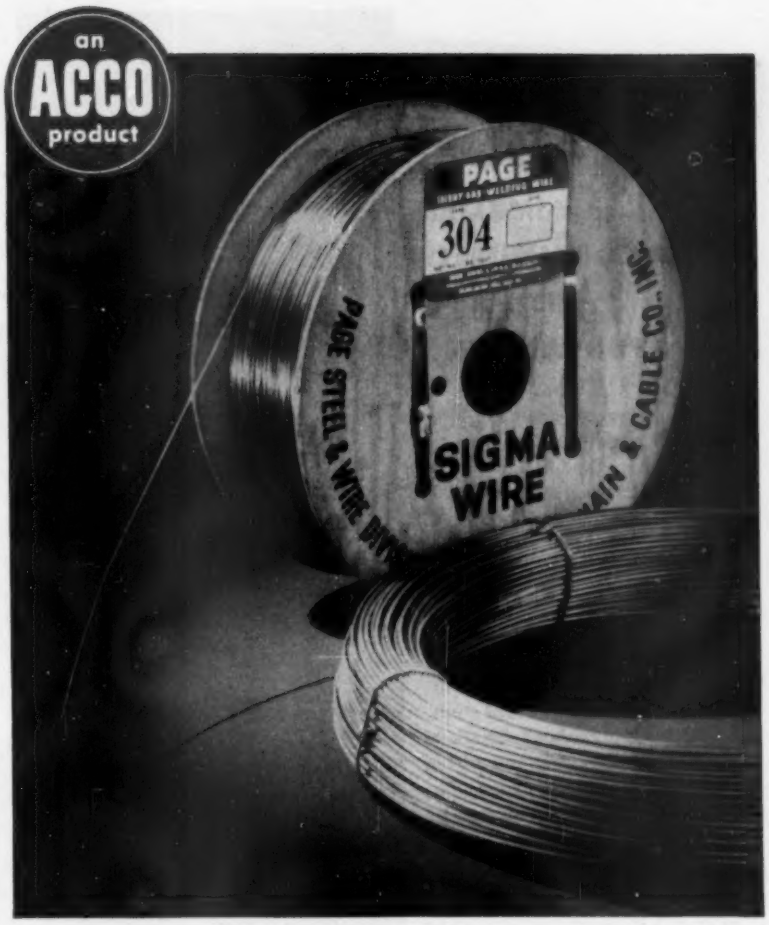
GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *

Alloy Electrodes

TWO new Eutectic electrodes are said to offer cost and strength advantages in the joining of light sections of low and medium alloy steel and stainless steel types 301, 302, 320B and 303. Typical applications of Eutec-Trode 69AC and 690-DC are the welding of alloy and stainless steels in architectural applications, railroad cars, trucks. They are also used for protective overlays on alloy steel shafts, clutch and brake friction disks or plates, etc. They come in 3/32, 5/32 and 3/16 in. diameters.

EUTECTIC WELDING ALLOYS CORP., 172nd St. & Northern Blvd., Flushing, N.Y.



Why You Should Use...
PAGE Automatic Welding Wire

• PAGE Automatic Welding Wire is made to rigid specifications which provide consistent characteristics for smooth flow of metal during continuous or intermittent welding. There are many analyses for a wide variety of uses.

for INERT GAS Welding

PAGE Stainless Steel Wire is precision thread-wound on 25-lb. non-returnable convenient reels which fit popular arc welding machines. Six Page-Allegheny grades; wire diameters: .035", .045", .0625".

for SUBMERGED ARC Welding

PAGE stainless, low alloy, and carbon steel wire in layer-wound coils, in 22" or 24" mill coils, or on 200-lb. returnable steel reels. Wire diameters from 1/32" to 5/16"; copper coated if desired.

ACCO

Write to our Monessen, Pennsylvania office for Bulletin DH-402

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE Welding Electrodes AND Rods

TO REDUCE PRODUCTION COSTS . . .

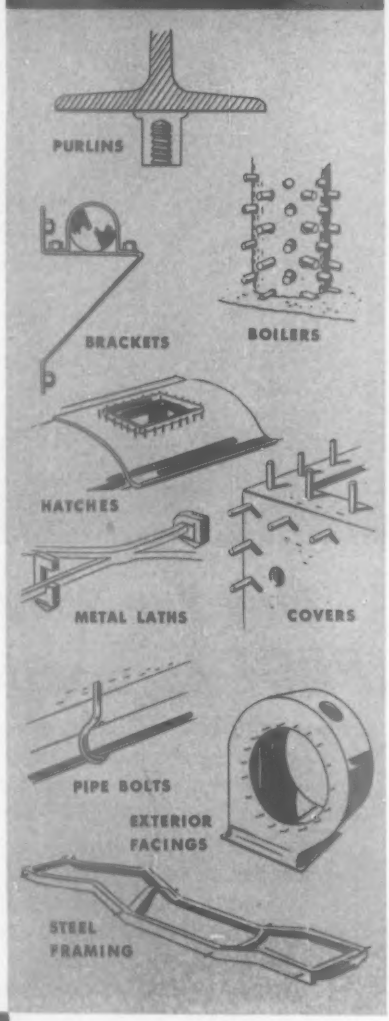
SIMPLIFY AND ELIMINATE WITH KSM STUD WELDING

Time-consuming drilling, tapping, grinding and the need for elaborate jigs and fixtures can be eliminated when stud welding is specified for fastening applications. Both design and assembly are simplified, production is boosted while substantial savings in labor and material costs are realized.

Stud welding is the efficient, fast application for plain studs, male or female threaded studs, with or without shoulders, eye-bolts, J-bolts, pins and a wide variety of square, rectangular, straight or bent shapes. Its applications are unlimited and have been thoroughly proved on countless applications.

Studs can be applied at the rate of six per minute and located within tolerances as close as .005 inches. True 90 degree positioning is assured. Weld strength exceeds that of the stud and the parent metal.

Some typical uses of stud welding are suggested and types of studs available are shown here. Whether or not your needs are illustrated, think in terms of stud welding. Investigate what it can do for you. Get the complete story of KSM engineered benefits. Write KSM Products, Inc., Merchantville 8, N.J.



KSM
STUD WELDING

350-lb X-Ray Unit

THE newest Andrex 250 kvp industrial X-ray, including control, weighs less than 350 lb. Completely portable, it fits into the trunk compartment of late model autos.

It will penetrate 4 in. of steel, operating off a 110 volt, 60-cycle supply. It can also be operated off 220 and 440 volt sources.

HOLGER ANDREASEN, INC., 703 Market St., San Francisco.

You're Welcome

Dear Sir:

In the May issue of THE WELDING ENGINEER, you had a feature story on my company. Since the release of this article, I have received several hundred calls from customers, friends, competitors and persons I haven't seen or heard from in years. Approximately 30 letters and six telegrams have also been received, each congratulating me on the good fortune to have had a feature story in your publication. Even at this late date, customers are remarking that they have read about us.

It is a thrill and a great compliment to be singled out by a publication such as yours, and I sincerely trust that we can maintain the standards that must govern you before publishing a story on any company or person.

This article has done more to further the prestige of my company in a few weeks than I have been able to do in the past eight years, or will probably do in the next 25 years. I will always be indebted to you for this fine tribute.

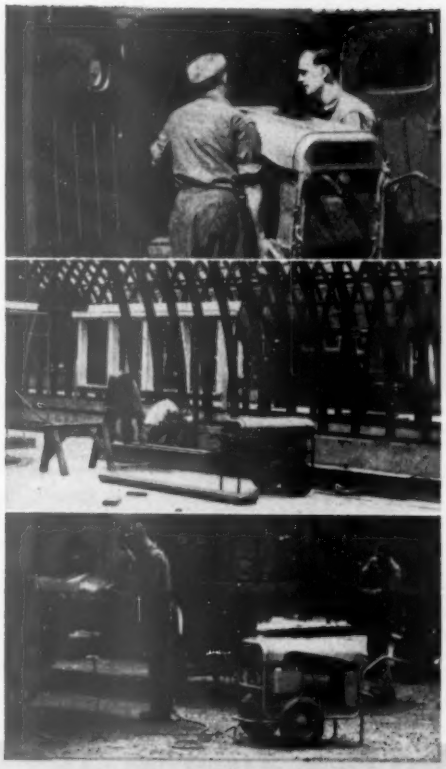
At this time, I would also like to comment on your general policy of furthering the future of the welding dealers and distributors. I have heard many complimentary remarks on the effort being made by you in behalf of all welding dealers and distributors.

Again, many thanks for your "Shirt Sleeves Distributor" story.

Very truly yours,
A. C. Axtell, President
Essex Welding Equipment Co., Inc., Newark

MORE WELDING AT LOWER COST

with Sureweld® Portable D-C Arc Welder



The Sureweld Portable Gas-Driven D-C Arc Welder is truly an amazing welder. Amazing because it is so small and light and portable. Amazing because it can get in where other welders cannot go. Amazing because you can do far more jobs *faster* with it than any other welder of its capacity.

One man can move it. Two men can lift it. Any auto, truck or station wagon can stow it. On the job it produces welding power at once and it handles 85-90% of all on-the-job welding. Most amazing of all, it saves so much, it repays its cost several times a year.

On multi-story building the Sureweld Portable moves easily from floor to floor with the operator—always within standard cable length of the work. No extra cable to buy. No power wasted because of excessive cable length. No hoisting of heavy cable from floor to floor.

In pipeline operations, the operator moves it as his work progresses—and thus his work progresses *fast!* In plant repairs, the Sureweld Portable is on the job in a jiffy and through with the job—in a jiffy. No shutdown of plant processes in order to tie a motor-generator set into a power line.

In these and many other ways Sureweld Portable increases production and saves its cost over and over again. Its price to you may cause you to revise your budget considerably. Users say they don't know how they got along without this most useful and economical piece of equipment.

Let us demonstrate the Sureweld Portable—any place you say. No cost or obligation. Use the coupon below or contact your nearest NCG branch or NCG authorized dealer.

NATIONAL CYLINDER GAS COMPANY
840 N. Michigan Ave., Chicago 11, Ill.
Branches and Dealers from Coast to Coast

NCG®
EVERYTHING FOR WELDING

Copyright 1953, National Cylinder Gas Company

NATIONAL CYLINDER GAS COMPANY E
840 N. Michigan Ave. · Chicago 11, Ill.

☐ Please rush Illustrated Bulletin NH-121 containing full details of the SUREWELD Gas-Driven D-C Arc Welder.

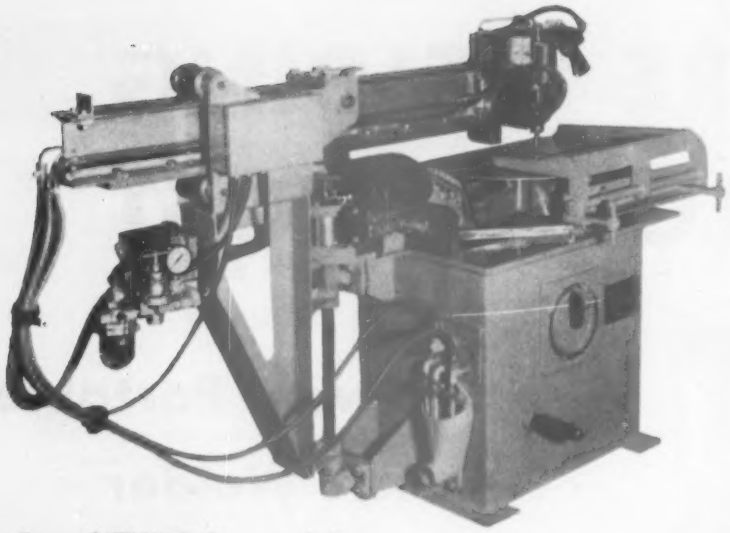
☐ You may arrange, at no obligation to me, a demonstration of the Sureweld.

NAME_____ POSITION_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____



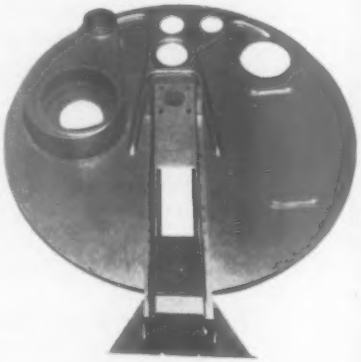
the $7500 welder that saved $25,000 the first year

A machine that increased production enough to effect savings that were double or triple the machine cost during the first year is news to many fabricators not familiar with the versatility of the modern resistance welder. With one man this machine will take the place of four conventional guns and two rocker arm welders requiring a total of six operators. It also eliminates the loss of production due to the unnecessary shifting of the work pieces between operations.

Here is factual proof that special equipment effecting cost saving need not be expensive.

Recent Federal designed and built machines have combined assembly with welding, forming with welding and high speed multiple-shop welding of complete assemblies.

This is part of the reason why—from the start—Federal has always been First In Resistance Welding.



This inner bulkhead assembly for an automatic dryer requires about 50 spot welds. Federal designed a new type expansion gun welder (above) where the gun is supported on the end of a horizontal beam mounted on rollers—moves in all directions—automatically welds as operator squeezes pistol trigger. Manufacturer figures this has saved $25,000 over old method during first year.

Federal WELDERS ®

Warco PRESSES ®

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

September Editorial

Dear Sir:

I just have to take time out this morning to compliment you on your editorial "What Were We Fighting for," appearing in the September issue of THE WELDING ENGINEER.

The article expresses most everyone's thinking on the subject, certainly mine, and I'm glad to see that a man in your position with access to editorial space has the courage of his convictions to use it in this manner.

The answers to your questions would indeed be interesting to hear and certainly be welcome by the American public; that is, if there are any logical answers.

It would be reassuring to feel that our government had some idea of returning to the original concept of governing: "a government of the people, by the people, and for the people."

With kindest regards,
Phil Welty
Rankin Mfg. Co.
Los Angeles

* * *

Recrystallization Welding

Dear Sir:

On my return from abroad, my attention was called to the paper by John M. Parks as presented at the Houston meeting of the American Welding Society. I also noted your remarks on page 26 in the August, 1953, issue of THE WELDING ENGINEER.

Mr. Park's paper leads one to believe that cold pressure welding is recrystallization welding. The experience of many large responsible organizations such as Bohn Aluminum, Alcoa, General Electric Co., Ltd., and others does not agree with Mr. Parks' theory that pressure welding is recrystallization welding. His results, tests and conclusions are entirely contrary to those found at laboratories of General Electric Limited and other licensees. We are somewhat surprised that he avoided mentioning the pressure welding developments and contributions of General Electric Ltd.

We are ready to show and prove decisively that his conclusions are not correct.

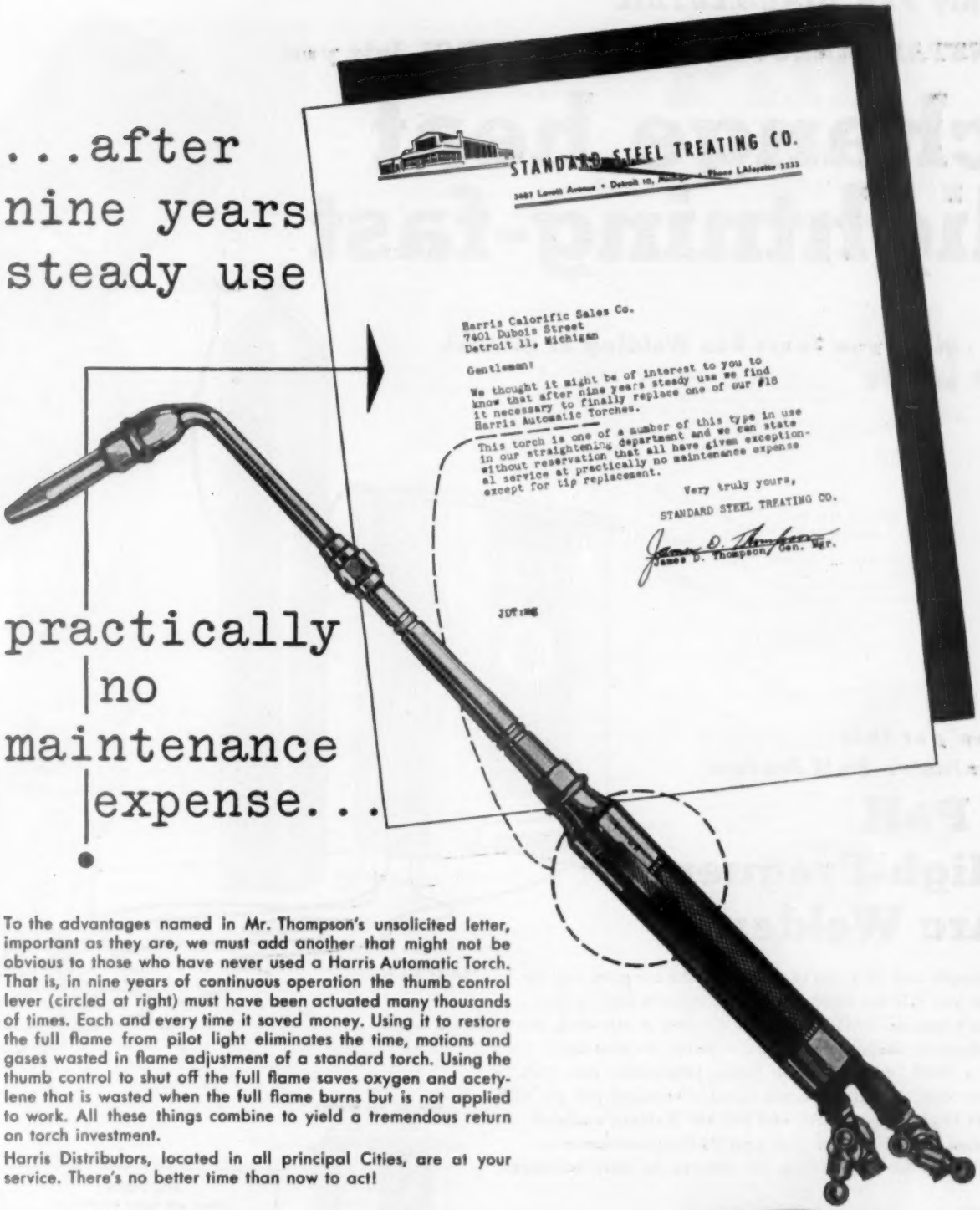
Yours very truly,
William Dubilier
Koldweld Corp.
New York City.

* * *

STEEL DATES—1937: *Boron was used as a steelmaking element. It is now coming in increasing prominence to enable other alloying elements to be conserved.*

...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

Only P&H DIAL-LECTRIC

INSTANTANEOUS REMOTE CONTROL lets you

change heat lightning-fast

. . . gives you Inert-Gas Welding at its best, AC and DC

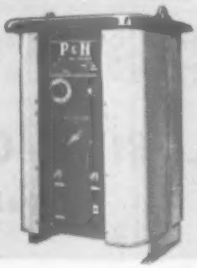
P&H AC Arc Welder

You get this exclusive P&H feature

in P&H High-Frequency Arc Welders

A simple turn of a dial or a touch of the toe gives you the heat you call for *right now* — not seconds from now! That's because P&H Dial-lectric Control is electrical, not mechanical. Response is instant — there's no time lag. It's a P&H "exclusive" that boosts production, cuts costs, saves time. And it's just one of the advantages you get with P&H High-Frequency AC and DC Arc Welders, available in sizes up to 625 amps. Ask your P&H representative or distributor for all the facts. Or write us for latest bulletins.

P&H DC Arc Welder



P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4813 W. National Ave. • Milwaukee 46, Wisconsin

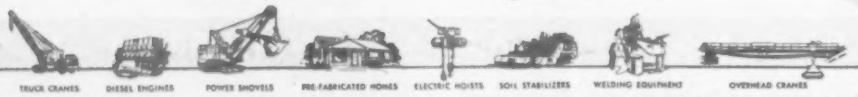
P&H DC Arc Welder

WELDORS !

Have you taken advantage of this money-saving offer?

Special P & H offer saves you almost three dollars on the greatest book of its kind ever offered! Two useful books in one: (1) Home Repairs Made Easy. (2) 101 Ways to Increase the Value of Your Home. A $4.95 value for only $2.00 postpaid. Look for order blank packed with P & H electrodes.

the P&H *Line*



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2991

E. R. WALSH speaks to NWSA

Record 154 Distributors Attend New York Meeting

THE largest number of delegates—154—ever recorded at an eastern zone meeting of the National Welding Supply Association met Sept. 17 and 18 at the Statler Hotel, New York City. Robert G. Jackson of Jackson Welding Supply Co., Inc., Rochester, zone vice-president, acted as chairman.

Among the speakers were NWSA President William A. Rice, of Virginia Welding Supply Co., Charleston, W. Va., who defined the association's policies for the current year; Norman H. Gimmy, of Beaumont, Heller and Sperling, Reading, Pa., who discussed the value of a direct-mail campaign to distributors; E. R. Walsh, of Alloy Rods Co., York, Pa., who spoke on the distributor's role in promoting the welding industry; and W. G. Benz, Jr., of The M. W. Kellogg Co., Jersey City, who told of the distributor's role in supplying material and equipment to the fabricating industry.

Secretary-Treasurer Robert C. Fernley discussed the association's record. A. M. Sullivan, of Dun and Bradstreet, Inc., presented a talk on today's management problems. During the discussion periods, A. C. Axtell, of Essex Welding Equipment Co., Inc., Newark, explained the advantages of group selling; Arthur K. Cottet, of Cottet's Welding Supply Co., Syracuse, spoke on the rental of welding supplies and equipment; and Howard R. Montaigne, of District Oxygen Co., Inc., Brentwood, Md., explained how reports from his firm's salesmen are utilized.

About 135 slide films were shown, depicting distributor sales aids, store fronts, etc.

* * *

Make Special Steel for Sulphate Digesters

IN response to a demand from the paper industry, Lukens Steel Co. is now making a special steel for sulphate digesters. The steel is of the rimming type similar to the rimming steels used in digester service some years ago.

New Federal Agency Replaces NPA

THE welding division of the new Business and Defense Service Administration will perform all functions of the former welding equipment section of the National Production Authority, which has been abolished.

Pete Hall, who was in charge of the resistance welding section under NPA, will be in charge of the welding section of the new agency. Companies experiencing difficulties in securing materials may apply for relief to the BDSA. The agency's purpose is a twofold one: (1) it will secure materials for the government, and (2) it will serve as a nucleus of a body that would undertake procurement duties in the event of an emergency.

The new group was to have moved from the G.A.O. Building to its new quarters in the Department of Commerce Building.

* * *

Ryan Gets $2,000,000 Order for Fuel Tanks

ORDERS for external wing tanks in excess of $2,000,000 were recently received by Ryan Aeronautical Co. from Boeing Airplane Co. The tanks will be used on Boeing KC-97 Stratofreighters.

Production of the new aluminum wing tanks is already under way, with deliveries scheduled over the next two years. Ryan has pioneered in the use of resistance welding in manufacturing huge streamlined tanks of this nature.

* * *

Ammunition Boxes to Be Seam Welded

PITTSBURGH Ordnance District has awarded a $1,687,000 contract to Follansbee Steel Corp. for the manufacture of more than a million seam-welded 50-caliber ammunition boxes. They will be made in the firm's Sheet Metal Specialty plant, Follansbee, W. Va.

Two production specialists will attend a two-week course in automatic seam-welding techniques given by Progressive Welder Sales Co., Detroit. Progressive is supplying $130,000 worth of welding equipment for the project.

The ammunition boxes, which hold 100 rounds each, will be used for both storage and transport. They must be waterproof and airtight and must withstand 200 hours of exposure to a salt-spray test. Ordnance officials explained that the boxes may be used to store ammunition over long periods of time or may see service in forward combat areas.

P&H

the industry's most complete line of cost-cutting welding equipment

P&H POSITIONERS

With one finger, you position heavy weldments for economical downhand welding. Capacities, 2500 to 36,000 lbs. — remote-control and hand-operated models.

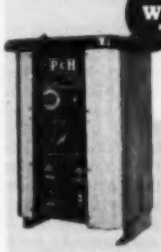
P&H LOW-HYDROGEN ELECTRODES

13 types for high-strength welds on problem steels, steel castings, nickel-alloy steels, chrome-moly steels, .40 carbon castings, high-hardenable steels, aircraft and similar steels.

P&H AC WELDER

Exclusive P&H Dial-lectric Remote Control gives you instantaneous heat selection at the work. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H WELDING TWINS



P&H DC RECTIFIER WELDER

Also has P&H Dial-lectric Control, for fingertip heat control. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WN-301 ENGINE-DRIVEN DC ARC WELDER

Portable—lets you weld anywhere, anytime. Has P&H Dial-lectric Control. Runs at only 1750 rpm. Welding service range, 60-375 amps., NEMA rated.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

2391A

P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

4513 West National Ave., Milwaukee 46, Wis.

Amco NO. 433

WELDING FLUX FOR STAINLESS AND ALL NON-CORROSIVE STEELS

Effectively removes oxides and prevents reoxidation of rod and base metal at welding temperatures.

AMERICAN SOLDER & FLUX COMPANY
2156 E. NORRIS STREET
PHILADELPHIA 25, PA.

"WE CUT REWORKS 94% with DryRod Electrode Oven!"

When 1 out of 3 welded hydraulic fittings were rejected at a leading Milwaukee machinery plant*, engineers blamed *moist electrodes.* Installing a low-cost DryRod Electrode Oven to store all unpackaged low-hydrogen rods, this company got *immediate* improvement . . . faster, better welds . . . few rejects. Their welding engineer said, *"DryRod successfully solved our welding porosity problem. With it we've been able to cut our reworks from 30 pieces to less than 2 per hundred!"*

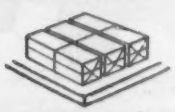
Get your money's worth

You pay a premium for stainless steel, low-hydrogen, and other mineral-coated electrodes. Preserve that "baked-in" quality with DryRod Electrode Oven. Ask your welding supply dealer, or write direct for free folder.

*Name on request

X-DR-12

Cut costs 4 ways with DryRod Method!



1 Store sealed cartons in warm, dry place.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

3 Locate DryRod as close to welding operations as possible.

4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

DryRod DIVISION OF Phoenix Products Co.
4715 N. 27TH ST. MILWAUKEE 16, WIS.

130 Distributors at Detroit Meeting

APPROXIMATELY 130 distributors and manufacturers were present at the Sept. 21-22 meeting of the central zone of the National Welding Supply Association, held at the Park Shelton Hotel, Detroit. It was termed the most successful meeting ever held in that zone. James N. Alcock, of Saginaw Welding Supply Co., and zone vice-president, presided.

NWSA President William A. Rice, of Virginia Welding Supply Co., Charleston, W. Va., read an open letter to a fictitious supplier. The values of a direct-mail campaign to distributors were expounded by Trayton H. Davis, of Trayton H. Davis Associates, Milwaukee. Jack Honhart, of Atlas Welding Accessories Co., Ferndale, Mich., listed the reasons his firm distributes through welding supply distributors.

Other speakers included: Tyrus R. Stansberry, of The Manufacturers National Bank of Detroit, who spoke on the interpretation of a financial statement; A. R. Walkley, of Maxwell & Moore, Inc., Muskegon, Mich., who reviewed the steps necessary for conducting a successful sales meeting; and Marshall Pease, of The Detroit Edison Co., who told what the industrial purchasing agent expects of distributors.

An association director, E. C. Caluwaert, of O. K. I. Welding Supply Co., Cincinnati, gave an address entitled "Be Yourself." J. H. Colwell, of Detroit Gas Products Co., Royal Oak, Mich., led a discussion in which he told how reports from his firm's salesmen are used.

A number of members toured the Ford Motor Co. plant.

* * *

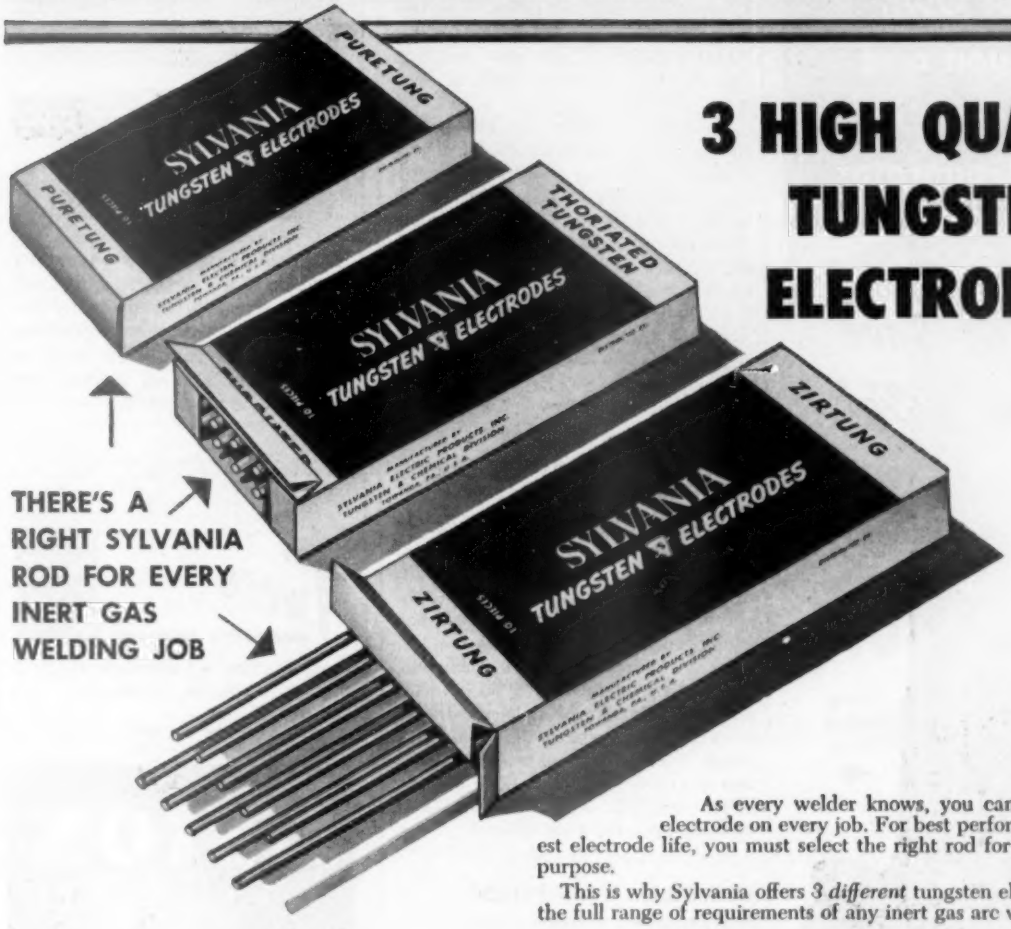
Add British Patents to Davis Welding Library

THE A. F. Davis Welding Library, located at Ohio State University, Columbus, O., recently acquired more than 2,200 abstracts of British welding patents. This brings the number of patents classified in its collection to more than 15,000.

The objective of the library is to assemble in one place all important literature on welding. The library was established in 1942 by A. F. Davis, vice-president and secretary of The Lincoln Electric Co., Cleveland. Ohio State is the only university offering a five-year course that leads to a degree of bachelor of welding engineering.

The facilities of the library are offered to all persons interested in welding.

NOW SYLVANIA OFFERS...



3 HIGH QUALITY TUNGSTEN ELECTRODES

THERE'S A RIGHT SYLVANIA ROD FOR EVERY INERT GAS WELDING JOB

As every welder knows, you can't use the same electrode on every job. For best performance and longest electrode life, you must select the right rod for every particular purpose.

This is why Sylvania offers 3 *different* tungsten electrodes to meet the full range of requirements of any inert gas arc welding work.

Sylvania . . . a pioneer in tungsten

Sylvania is a pioneer in the development of tungsten in many forms. As a result, our engineers and metallurgists have provided the precise type of tungsten rod for every need. Sylvania's research and advanced techniques in manufacture and quality control . . . from ore to finished product . . . assure minute-saving operation and dollar-saving dependability.

Either Sylvania Puretung, Thoriated Tungsten or Zirtung Electrodes will answer any inert gas welding problem you have. So, order the types you require from your nearest Sylvania Welding Distributor today, or write to: Sylvania Electric Products Inc., Dept. 3T-4311, 1740 Broadway, New York 19, N. Y.

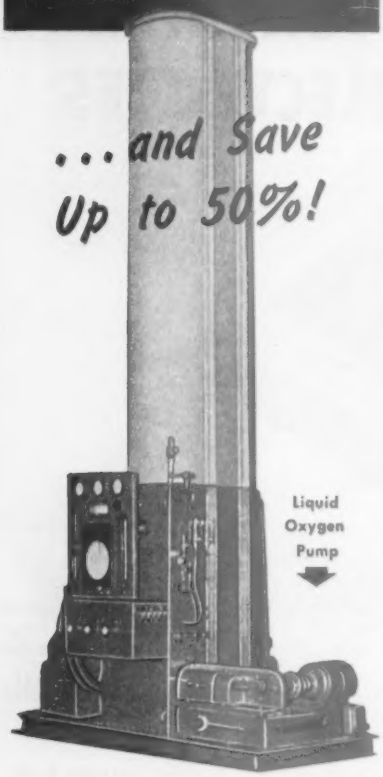
SYLVANIA

LIGHTING · RADIO · ELECTRONICS · TELEVISION

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., St. Catherine Street, Montreal, P. Q.

NOW-Make Your Own Oxygen and Nitrogen in One Generator

...and Save Up to 50%!



With INDEPENDENT'S newly-designed generators, you can make your own high-purity oxygen and nitrogen from the free air . . . and in the same generator.

You reduce costs up to 50% by eliminating handling costs . . . vaporizing costs . . . evaporation losses . . . residual losses . . . and transportation costs.

INDEPENDENT Generators are available in any capacity, any purity and any pressure. Put your oxygen-nitrogen problem up to us . . . our engineering department will gladly submit recommendations . . . no obligation, of course!

INDEPENDENT ENG. CO., Inc.

CONSULTING · DESIGNING · RESEARCH

O'FALLON 5, ILLINOIS

Radioactive Gas for Welding Tests

RADIOACTIVE gas is being used by a large Australian oil refinery to discover flaws in welded joints of the metal columns of its new refinery. The refinery is being built at Geelong, Victoria.

Radiographic films are attached to the outside of the columns. Rays produced by the gas penetrate the columns and register on the film, which is later developed. The negative reveals any weaknesses in the welding, the shadow pictures produced being similar to those in X-rays of the human body. The refinery's scientist wears on his coat an instrument that records the amount of radioactivity absorbed by his body.

—McGraw-Hill World News

* * *

Ordnance Conducts Research on Heavy-Gage Aluminum

EXPERIMENTS conducted by the Frankfort Arsenal on welding 24ST and 63ST aluminum of more than 2-in. thicknesses have so far proved unsuccessful. Some of the research has been done on plates up to 5½ in. thick. Alloying filler wire materials, other than 2S and 43S base metal analysis, has also been tried without success. The strength of the welded joints made on heat-treated alloys was not consistent. Only 60% of base metal strength could be depended upon in the weld zone.

* * *

Continuous Welded Rails for Japanese Roads

MUCH of the noise and jolting of Japanese railroad trains will be eliminated through the use of a continuous welded rail developed by Yoichi Hoshino, of the National Railway Corp.'s Technical Research Institute. The state railways will begin laying sections of 3,280 ft (1,000 m) and 6,560 ft (2,000 m) before 1954.

Because trains run every 20 minutes on main Japanese lines, large car-mounted welding equipment cannot be used. Hence the Institute has completed a portable gas-welding machine that can be unloaded and operated on the side of a track. The welder weighs about 2 tons and measures 7.6 by 4.44 by 3.72 ft. It cost approximately $5,600.

The National Railway Corp. expects great savings in track maintenance. Car wear will also be reduced because of the elimination of jolting. The new rail will first be used on the Sanyo line between Kobe and Shimonoseki.

—McGraw-Hill World News

"CONNECT WITH TWECO"

CABLE SPLICERS

A permanent splice to repair broken welding cables. Install with a wrench (or solder if desired) for a quick and efficient connection. Insulated with a tough fiber sleeve, 3 sizes for cable #6 through 4/0.

Use TWECO cable connections to improve your welding efficiency. Ask for TWECOLOG No. 8 with complete specifications and prices.

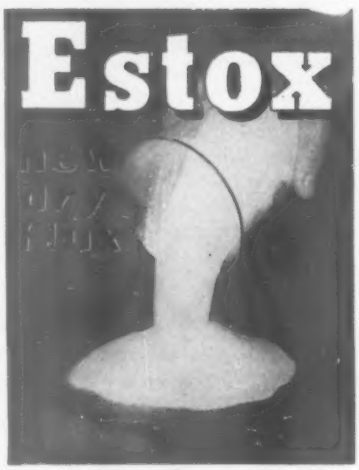
See Your Welding Supply Distributor

Tweco PRODUCTS COMPANY

TWECO PRODUCTS

BOSTON AT MOSLEY ST.
WICHITA, KANSAS

Estox



FREE FLOWING. Contains new additive that cleans surfaces, insures better joints.

Estox 100—For Cast Iron brazing and welding.

Estox 200—For Brass, Bronze and Silver Brazing. Try it out on your toughest welding job—stainless steel.

Sold and billed through welding supply distributors. Or you may order direct, advising name of supplier.

Two shipping points: New Haven and Detroit

STANDARD RESEARCH, Inc.

460WE Grand Ave., New Haven, Connecticut

No Weld Failures in Ships Built Since 1948

THERE has been no indication of failures in welded ships built under the specifications laid down in 1948 by the American Bureau of Shipping. These specifications require higher manganese and lower carbon content in all hull plate more than ½-in. thick.

The National Bureau of Standards has been receiving samples of ship plate involved in failures since 1943. Its findings have proved that welding is not the primary cause of such failures. Rather the primary cause has been found to be the combination of stress concentration and steel that is notch sensitive at the operating temperature. Mechanical tests used during World War II did not detect the notch sensitivity of the steel used in hull plate at that time.

Laboratory investigation includes examination of the fracture and welds, microscopic examination, chemical analysis of the plate, Charpy vee-notch tests and tension tests.

* * *

New Alloys Meet Demands Where Going Is Tough

MODERN conditions of industry, including oil refining, chemical processing, gas and steam turbines and jet aircraft, are making exacting demands on metallic alloys for service under high temperatures and pressure. According to the Alloy Casting Institute, New York City, these demands are being met by a group of chromium-nickel-iron cast alloys. These are the so-called "high" alloys, having an alloy content greater than 8%. They are divided into corrosion-resistant and heat-resistant groups.

Full information on the welding of these increasingly important alloys was given in THE WELDING ENGINEER in the articles, "How to Weld High-Alloy Castings" (April and May, '53) and "How to Weld the Heat-Resistant Alloys" (September, '53).

* * *

New Distributors

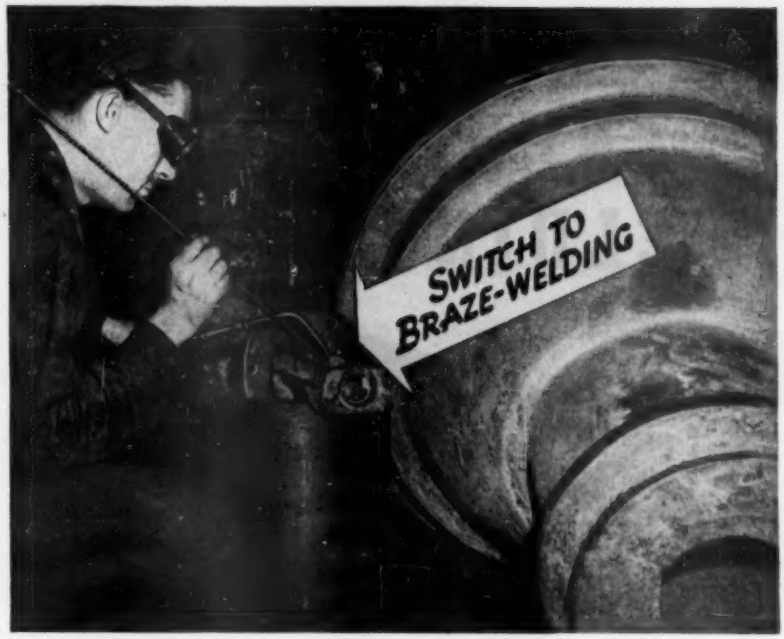
Alex Latta Ltd., Edmonton, Alberta, Canada, and Welders Supplies Ltd., Calgary, Alberta, Canada, for Rankin Mfg. Co., Los Angeles.

The Henry Walke Co., with offices in Norfolk, Va., and Charlotte, W. Va., for the Carboloy Department of General Electric Co.

U. S. Steel Supply Division of U. S. Steel Corp., West Coast distributor for A. O. Smith Corp. welding products.

Pacific Metals Co., Ltd., for Westinghouse Electric Corp. welding products.

Braze-welding bearing bonnet for pump on pickling machine



3 ways you profit with

Bridgeport No. 192 Low Fuming Bronze Rod

1. Quicker repairs . . . Only local preheating is needed, and repairs can often be made without dismantling equipment. This means less downtime, plus savings in time and expense because there is no need to build elaborate setups for general pre-heating and slow cooling.

2. Stronger repairs ... Sound, lasting repairs are made by this method. In fact, braze-welded areas are often stronger than the original metal because of the absence of brittleness.

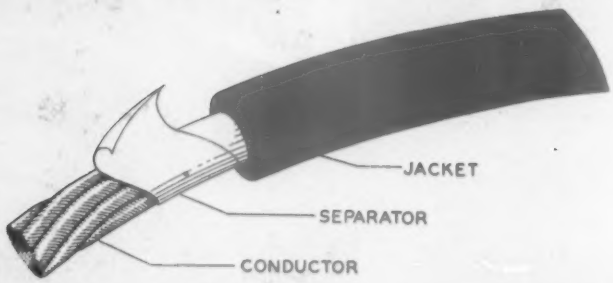
3. Many varied uses ... In addition to repairing broken cast iron or steel equipment, Bridgeport welding alloys are extremely useful for regular production work, and for building up worn surfaces.

Write for free Bridgeport booklet, "Bronze Welding Alloys." Contains much valuable information, with suggested procedures and step-by-step illustrations. Write for your copy today.

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rod A PRODUCT OF **BRIDGEPORT BRASS**

SUPER-FLEXIBLE NEOPRENE WELDING CABLE



DALWELD Welding Cable is constructed of fine, soft, bare copper wires enclosed in a fine separator and sheathed with a tough, durable, oil- and heat-resistant Neoprene jacket—ASTM Specification D-752. DALWELD Welding Cable is specially designed to give the maximum of flexibility and to stand up under all types of heavy duty service.

WRITE TODAY FOR COMPLETE PRICE INFORMATION

Dealer inquiries invited

DALWELD COMPANY, 1 Bertel Avenue, Mount Vernon, N. Y.

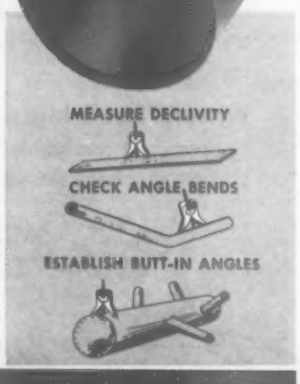
DIAL SET LEVEL

MARK A CENTER LINE *at any angle*

DIAL SET 45°

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

CONTOUR MARKER CORP.
1843 E. Compton Boulevard, Compton, California



Boyce **CENTERING HEAD**

Aluminum Skyscraper Erected in Pittsburgh

AMERICA's first aluminum skyscraper —the 410-ft Alcoa Building in the heart of Pittsburgh's Golden Triangle —was dedicated Sept. 15. It is the lightest building for its size ever built. Twenty-five floors of the ultramodern 30-story structure are occupied by Aluminum Company of America; the balance has been rented to tenants.

The building's exterior walls are sheeted with hundreds of 6 by 12 ft aluminum panels. Its windows—about 4 ft square—are reversed for cleaning from inside the building. Insulation is provided by an inflatable rubber tube recessed in the window's aluminum frame. All electrical wiring and most of the plumbing are aluminum, as are the lighting fixtures, elevator cabs, partition framing and many thousands of pounds of interior trim.

* * *

U. S. Steel Revises Its Sales Policy

UNDER a recently revised sales policy, U. S. Steel Corp., will, if a customer so desires, quote delivered prices that reflect full transportation charges. It will continue to quote prices f.o.b. its mills. B. F. Fairless, chairman of the board of directors, said the new policy does not constitute a return to the so-called multiple basing point method of selling that was abandoned in 1948.

* * *

3-Dimensional Signs for Welding Distributors

THREE-dimensional counter and window-display signs have been made available by American Manganese Steel Division, Chicago Heights, Ill., to its authorized welding products distributors. In three colors, the flashing signs' 3-D effect is achieved by use of mirrors.

NOW A WESTERN ELECTRODE PLANT TO SERVE OUR WESTERN CUSTOMERS

AR-21

WESTERN headquarters for:

ARCALOY stainless steel electrodes

BRONZE-ARC phosphor bronze electrodes

NICKEL-ARC electrodes for cast iron

TOOL-ARC electrodes for tools and dies

WEAR-ARC hard-facing electrodes

WELD-ARC low hydrogen electrodes

NOW IN PRODUCTION ... the Pacific Coast Division manufacturing plant of the Alloy Rods Company ... world's leading manufacturer of alloy arc welding electrodes ... at 750 Lairport Street, El Segundo, California. Today all industries in the eleven Western States can secure the finest quality electrodes and rapid delivery on all six internationally-recognized brands of the finest electrodes made—anywhere. *Write, telephone, or wire for prompt shipment.*

HERMETICALLY SEALED • Package protection via 5 and 10 lb. hermetically sealed all-metal containers . . . every electrode "oven fresh" from factory to point of use!

ALLOY RODS COMPANY

NO FINER ELECTRODES MADE . . . ANYWHERE

•

General Offices & Plant
YORK • PENNSYLVANIA

Pacific Coast Division
EL SEGUNDO • CALIFORNIA

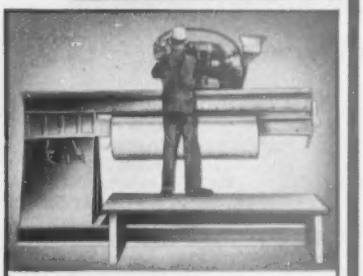
IN CANADA • Distributed by Canadian LIQUID AIR Company, Limited—Branches, Plants, Warehouses and Dealers Coast to Coast.

Alloy Rods Co.

REED
ENGINEERING CO.

Modern
Metalworking
Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



HORN TYPE WELDING JIGS

- ★ In 6 models; capacities up to 9 ft. x 3/8 inch
- ★ In 2 styles for light or heavy shells
- ★ Water-cooled copper weld backing bars
- ★ Positive, rigid, toggle-action clamping
- ★ Track for any automatic welding head

REED WELDING POSITIONER

- ★ Machined face with cast-in "T" slots
- ★ Machine Tool accuracy
- ★ 10-to-1 speed variation
- ★ Ball bearing work table mounting
- ★ 1000, 2500 lb. models, hand or power tilting
- ★ Rotating ground connection

WE INVITE YOU . . .
to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

Kansas Farm Youth Wins Top Lincoln Welding Award

FIRST prize of $600 in The James F. Lincoln Arc Welding Foundation's annual arc-welding award program went to Valgene Slingsby of Clay Center, Kan. Young Slingsby told how he made labor-saving equipment for use on the 240-acre diversified farm he works with his father.

The Foundation's 1952-53 awards were made to high school farm boys in 27 states for their descriptions of how arc welding is or could be used in farming. The program is conducted annually.

* * *

Welded-Steel Mast for Australian Radio Station

AN UNUSUAL welding job was recently completed by Australian engineers when a 456-ft tubular-steel mast for radio station 6BY was erected at Bridgetown, Western Australia. The station specified steel tubes rather than structural steel construction because of a 60 to 70% weight saving.

The mast was built in three sections at Sydney, then transported to Western Australia. It is supported by steel guy cables at its 150-ft, 300-ft and top levels. It rests on an insulator and steel ball, which are set in a bed of concrete 6 by 6 ft. The welded mast weighs 18½ tons, as compared with an estimated 50 tons required for a mast built of steel angles. The tubular-steel construction fulfills the requirements of the station's engineers.

—McGraw-Hill World News

* * *

Welder Impaled

IMPALED by a 2 by 4 plank, this welder was not caught in a "twister." The crate rolled off a trailer while being delivered. An official of the Miller Electric Mfg. Co. says "there is absolutely no truth in the statement that the welder narrowly missed Marilyn Monroe, who was hitch-hiking her way to Toledo."

JOHNSON'S NEW
All-Purpose
BRAZING FLUX

JUST HAS SOMETHING NO OTHER FLUX HAS

YES experienced welders have found that this new all-purpose brazing flux really travels . . . really cleans metals . . . and DOESN'T BURN OUT!

TRY JOHNSON'S NEW FLUX on the toughest job in your shop . . . you'll be convinced that this flux beats any other flux you've ever used!!!

FREE SAMPLES
Sent upon Request

JOHNSON
MANUFACTURING CO., INC.
601 First Ave.
Mount Vernon, Iowa

WELDERS' CLAMPS

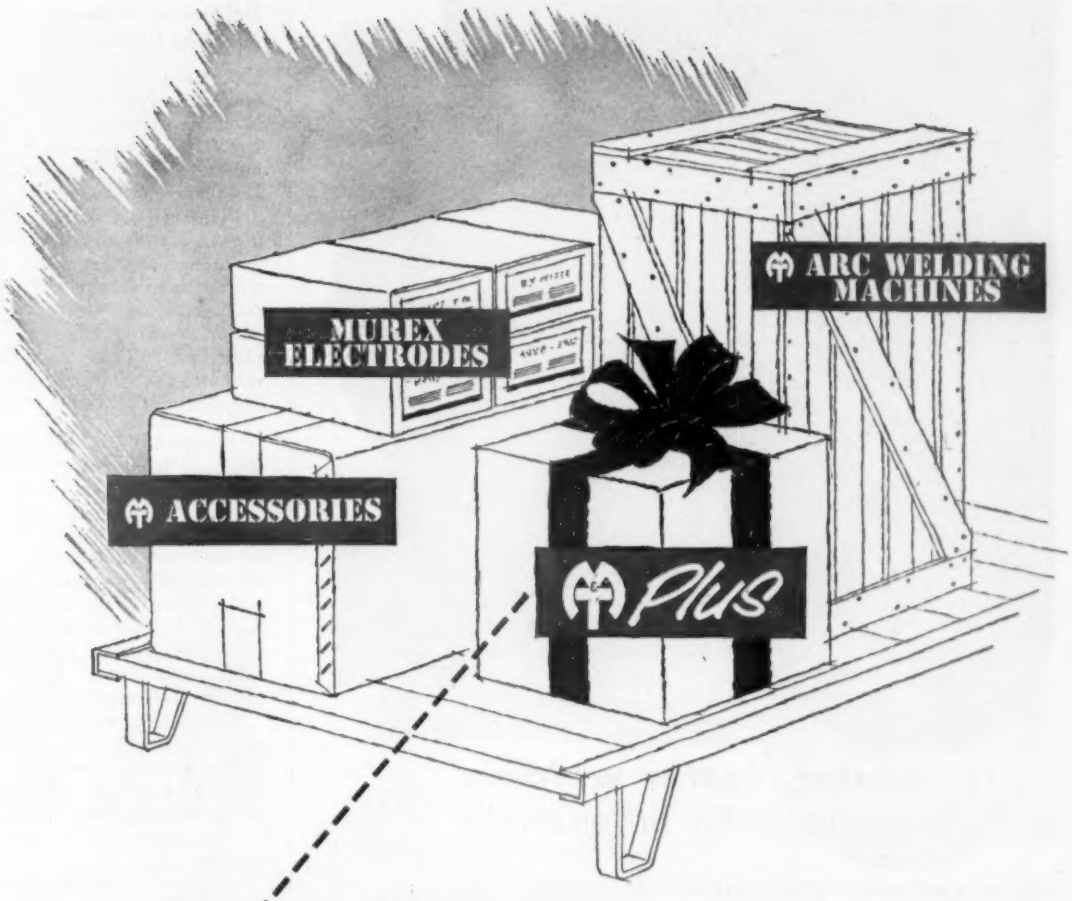
HARGRAVE
Tested Tools
THE CINCINNATI TOOL COMPANY

Each Tool Is Individually Power - Tested

Ask for CATALOG showing the most complete line of CLAMPS. Stock sizes from ¾" to 12' opening ½" to 16" deep.

THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU



YOU GET *INTANGIBLES*, TOO — at M & T

EXPERIENCE — *Your M & T representative is a seasoned, practical welding engineer*

CARE — *eager and able to meet your welding needs and consult on your welding problems*

SERVICE — *promptly and efficiently.*

— for a complete line of materials, accessories and equipment
— for a dividend of experience, care and service

METAL & THERMIT CORPORATION

100 East 42 Street • New York 17, N. Y.

MUREX ELECTRODES • ARC WELDERS • ACCESSORIES

DETINNING
THERMIT WELDING
METALS and ALLOYS
ARC WELDING — Materials and Equipment
CHEMICAL and ANODES for Electrotinning
CERAMIC OPACIFIERS
STABILIZERS for Plastics
TIN, ANTIMONY and ZIRCONIUM CHEMICALS

For ***easier, faster welding***
use one electrode for all positions

Gas or liquid retaining hortonspheres are welded in the field. In the process, every welding position is used—downhand, vertical and overhead. Today, because *one electrode* can produce sound weld metal from every position, considerable time is saved by eliminating frequent electrode changes.

You can profit from this same advantage by using Arcos Low Hydrogen Electrodes for welding high tensile steels. With few exceptions, once you select the proper electrode, you can keep on welding with *one electrode* —no need to change electrodes for different welding positions. Besides saving time, inventory can be simplified. Arcos quality controls, highest in the industry, assure you dependable, uniform weld metal for every application. Write for "The ABC's of Welding High Tensile Steels".

ARCOS GRADE	A. W. S. SPEC.
Tensilend 70	E7016
Tensilend 100	E10016
Tensilend 120	E12015
Manganend 1M	E9015
Manganend 2M	E10015
Nickend 2	E8015
Chromend 1M	E8015
Chromend 2M	E9015

ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Penna.

WELD WITH ARCOS
LOW HYDROGEN ELECTRODES

Baltimore Scene of Welding Clinic

THE FIRST welding show and clinic ever staged by a welding distributor in the Baltimore area will be held from 2 to 9 p.m. Nov. 19 and 20 at the store and warehouse of Earlbeck and Landrum, Inc., 1023 Cathedral St.

Plans call for more than 20 manufacturers and suppliers to have factory engineers on hand to demonstrate the newest in welding methods and processes. George E. Linnert, senior research engineer of Armco Steel Co., will also be present to aid visitors in solving welding or welding metallurgical problems.

* * *

Gamma Rays for Welding Tests

GAMMA rays (as well as X-rays) will be used for radiographic inspection of welds at the Kwinana Refinery, now under construction near Fremantle, Western Australia. The refinery is being built by Anglo-Iranian's associate company, Australasian Petroleum Refinery Ltd.

Radioactive isotopes for the gamma radiography will be flown from Britain's atomic research station at Harwell, England. The use of isotopes, which are very small, will permit the inspection of normally inaccessible welds.

—*McGraw-Hill World News*

* * *

Prefab Steel Arch May Speed Building

A NEW type of steel building arch, being manufactured by Wall Mfg. Co., Ipswich, S. D., lays claim to being stronger, less expensive and more easily used in more types of buildings than others now on the market. Welding is employed in the fabrication of this product.

These multiple-rib building arches allow steel buildings to be insulated without any of the outside steel touching the inside. This will eliminate condensation, it is said. With these arches, structures can be made into almost any size or shape.

* * *

Lindberg Moves Hydraulic Division From Main Plant

IN ORDER to increase its manufacturing facilities for production of air and hydraulic cylinders and related equipment, Lindberg Engineering Co., 2444 W. Hubbard St., Chicago, has moved its Air & Hydraulic Division from the main plant to 225 N. Laflin St., Chicago. Expansion plans are being directed by L. A. Shea.

J. M. GRAY has been named national sales manager for the welding and head and eye divisions of Dockson Corp., Detroit. He has been associated with Dockson as regional sales manager in the Midwest for the past 10 years. In his new position, Mr. Gray will also be sales manager for Dockson's Detroit retail outlet—The Sterling-Dockson Co. He is a graduate of Bradley University.

* * *

Tancula

Henzlik

FELIX T. TANCULA has been appointed assistant editor of THE WELDING ENGINEER. He replaces WILLIAM C. HENZLIK, who has left to study theology at the University of Chicago, after having been awarded a $1,400 scholarship there. Mr. Tancula is 28 years old and is a graduate of the University of Illinois. He attended Loyola University in Chicago, after three years' service in the army as a staff sergeant and battalion communications chief. His previous position was assistant editor of *The Streamliner*, house organ of Electric-Motive Div., General Motors Corp., La Grange, Ill. His newspaper work was with the Appleton (Wis.) *Post-Crescent* and the *Elmhurst (Ill.) Press*. He is a member of Sigma Delta Chi, professional journalistic fraternity. His hobbies include writing, reading, music and close checking on baseball, football and other sports activities.

* * *

A German scientist—DR. KURT P. ANDERKO—has been appointed full research metallurgist by Armour Research Foundation of Illinois Institute of Technology, Chicago. He has been in this country only a few months. Chemistry and physical metallurgy are his specialties.

When high operating pressures call for ***strong welds . . .***

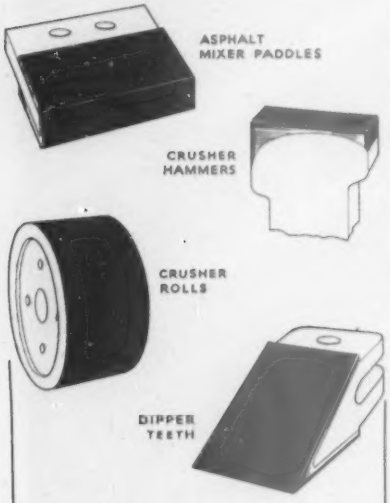
Arcos stainless electrodes can deliver top-performing weld metal for high-pressure jobs—as well as others—because the specific qualities needed are "built in" every electrode. Arcos makes many electrodes for all kinds of jobs—each requiring a different balance of physical, chemical, or metallurgical properties. But, no matter how varied the requirements, Arcos electrodes will meet every one—consistently—yielding in the flash of an arc the highest grade weld metal available today.

For more information about specific applications of Arcos quality-controlled stainless electrodes, send for booklet, "What Electrode Would You Use?"

ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pennsylvania

WELD WITH ARCOS STAINLESS ELECTRODES

BUILD UP WORN PARTS WITH REXARC S-3; HARD-FACE WITH 55



Build up with Rexarc S-3 and hard-face with "55" is a hard and fast rule with experienced weldors who know their "hard rod".

Why this popularity? The superior qualities of "S-3" are well known. Weldors acclaim Rexarc 55 for its extreme ease of application in any position, AC or DC. They like the smooth laydown . . . the tough, hard deposit that registers 54-60 Rockwell "C" in one pass!

Yes, where there's extreme impact and severe abrasion, specify Rexarc S-3 and 55 for best results. If you haven't tried this successful combination, call your Distributor, to day.

REXARC
HARD-FACING AND MANGANESE ELECTRODES

THE SIGHT FEED GENERATOR COMPANY

55 East Third Street
West Alexandria, Ohio, U.S.A.

H. C. MATHEY and BICKNELL LOCKHART were recently elected vice-presidents of The Liquid Carbonic Corp. by the board of directors. In his new position, Mr. Mathey will be general manager of the Pacific Division, as well as president of the Stuart Oxygen Division. He has been with the company since 1926. Mr. Lockhart will be in charge of all durable goods manufacturing activities in Chicago. He joined the firm in 1952.

* * *

EDWARD K. HOW has been named manager of sales for the Welding Department of General Electric Co. The Welding Department, now located in Fitchburg, Mass., will soon be transferred to York, Pa. The move is expected to be completed by March, 1954. Mr. How joined G-E in 1929, immediately after his graduation from Dartmouth College. Until his most recent promotion, he was sales manager of the G-E Locke Department.

* * *

M. J. ANDREWS was recently named manager of the Emeryville, Calif., store of Balaam Bros., welding equipment and supply distributors. Mr. Andrews recently sold his ownership in California Welding Gases, Inc., Salinas, Calif. For several years he has been secretary-treasurer of the Independent Welding Distributors Association.

* * *

ROBERT E. POETHIG will head the newly-consolidated department of research and production engineering at The Bastian-Blessing Co., Chicago. He was formerly director of research and development. With Bastian-Blessing since 1939, Mr. Poethig is a former board member of the Liquified Petroleum Gas Association. He also served as chairman of the LPGA's committees on technical standards and education and safety.

* * *

DONALD W. WITHROW has been appointed methods engineer for Electro Refractories & Abrasives Corp., Buffalo, N. Y. He was formerly development and design engineer for Buffalo Pottery Co., Buffalo; A. J. Wahl Co., Brockton, N. Y.; and M. W. Kellogg Co., New York City. He studied mechanical engineering at the University of Buffalo and the University of Texas.

For Permanent Good Results in Welding

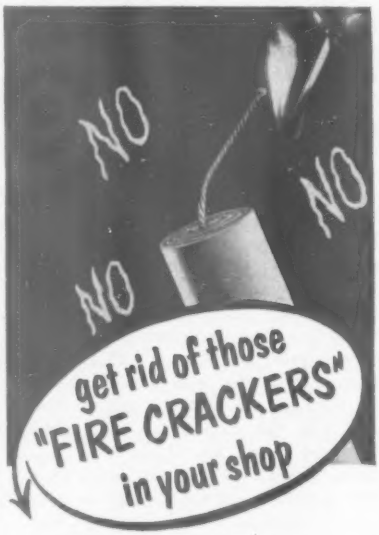
METAL BOND SOLDERING AND WELDING PRODUCTS

- TINNING COMPOUND—cleans and tins in one operation
- SOLDERING SALTS—takes place of acids—fast cleaner
- HARD METAL—for scored cylinders and cast iron soldering
- ALUMINUM SOLDER—for cast or drawn aluminum and die-cast metal
- MOULDOUGH—for backing up job to weld against
- BRAZING FLUX NO. 10—for brazing all metals
- SPECIAL NO. 31—cast iron brazing flux
- ALUMINUM WELDING FLUX—for cast or drawn aluminum
- SEAL-X-O—for filling pin holes in electric welds
- CAST IRON WELDING FLUX NO. 4—also All Steel Wire Brushes and Rod Holders

METAL BOND

Try them yourself—find out why they are so widely used. Our handy-size catalog will give you helpful advice—send for it!

METAL BOND MFG. CO.
3201 KOSSUTH AVE.
ST. LOUIS 7, MISSOURI



What fire crackers? We mean those welding and cutting torches that keep popping—back-firing—burning out valve seats. Did you know that the ingenious new Smith "FLO-TROL" prevents reverse flow of acetylene—protects torch against backfire and burned out seats?

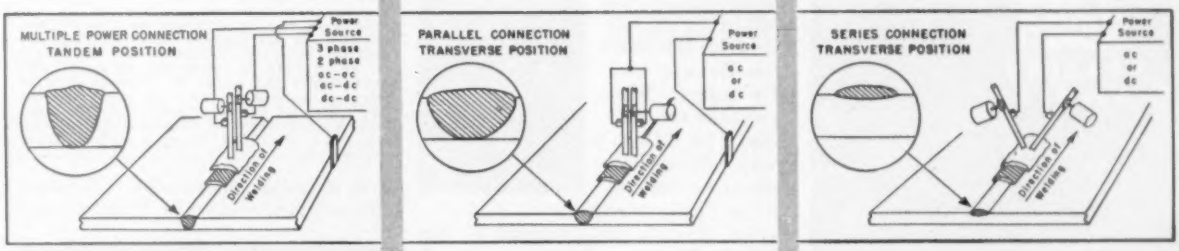
Write us a card . . . NOW!

SMITH WELDING EQUIPMENT CORPORATION
Dept. WE-81, 2633 S.E. 4th St., Minneapolis, Minn.

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.

Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.

Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

Linde TRADE-MARK

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Low Temperature BRAZING will help you cut your metal JOINING COSTS

BRAZED AND SO TOUGH YOU CAN

BEND IT
TWIST IT
STAMP IT
DRAW IT
HAMMER IT
and it won't break or leak under pressure

Dependable United WIRE BRAZING ALLOYS

For the STEELS IRON NICKELS
SIL-FOND
For the BRONZES BRASSES
PHOSON
For the COPPERS
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For complete information ask your WELDING SUPPLY DISTRIBUTOR or our nearest office

OUR BULLETIN No. B-29-4 TELLS YOU HOW TO BRAZE THREADLESS FITTINGS TO TUBING

Ask for your FREE COPY

UNITED WIRE
& SUPPLY CORPORATION
PROVIDENCE, RHODE ISLAND
SALES OFFICES
New York Chicago Akron Philadelphia
Rochester Lansing, Mich. Los Angeles
Minneapolis Pittsburgh Springfield, Mass.
Hartford, Conn.

C. C. HURLBURT has joined the welding division of P. R. Mallory & Co., Inc., Indianapolis, Ind. He has been associated with the aircraft industry for many years and was recently chief standards engineer for the Piasecki Helicopter Corp. Before that, he did procedure and engineering standards work for Fairchild Engine & Airplane Corp. and for Curtis-Wright Corp. Mr. Hurlburt attended the University of Arkansas. He is a former member of the National Aircraft Standards Committee, former chairman of the Helicopter Standards Committee and is currently a member of the Society of Automotive Engineers.

* * *

The Distinguished Service Award, highest honor in the liquified petroleum gas industry, was recently bestowed upon ELLSWORTH L. MILLS, vice-president of The Bastian-Blessing Co., Chicago. The presentation was made by Woodward Martin of the Shamrock Oil & Gas Corp., Amarillo, Tex., a past-president of the LPGA. The award carries with it an honorary life membership in the association. Mr. Mills was a member of the original board of directors of the American Welding Society. He also is a past-president of the Gas Products and International Acetylene Associations.

* * *

JOSEPH N. KUZMICK has been appointed coördinator of corporation research and development by Raybestos-Manhattan, Inc., Passaic, N. J. His duties will extend to all divisions of the corporation. His headquarters will be at Passaic. Mr. Kuzmick has been with the Manhattan Rubber Division for more than 30 years. During that time, he has been active in the development of asbestos and sintered metal friction materials, abrasive and diamond wheels, resins and plastic products.

* * *

DR. NEWMAN W. THIBEAULT has been named assistant director of research and development in charge of the physical research and microscopic sections by Norton Co., Worcester, Mass. He succeeds the late A. ALBERT KLEIN, who died last August. Dr. Thibeault came to Norton in 1936 as a petrographer (rock classifier) and was closely associated with Mr. Klein until the latter's death.

Reduce Spot-Welding Rejects With Dice Microhm Meter
(Model 151-S)

MIL-W-6858 and MIL-W-6860

This instrument, first developed by Dice, is now widely used in industry to maintain quality control and reduce rejects in the spot-welding of aluminum . . . by checking the surfaces of sheets to see that they have been properly cleaned. The Dice Model 151-S Microhm Meter measures resistances as low as ½ microhm in the low range to 750,000 microhms (in the highest range). A low resistance reading indicates that the metal to be welded is properly cleaned. The first Model 151 made by Dice is still in perfect working condition after almost five years of constant use. For free bulletin giving detailed information on how the Dice Microhm Meter can help you, write today.

J. W. DICE CO., Englewood 1, New Jersey
"Non-destructive Testing and Measuring Instruments"

SAVE 95.5%

THERMACOTE TRIPLE-DUTY COVER LENS
CLEARER VISION ELIMINATES EYESTRAIN
GUARANTEED TO OUTLAST ANY LENS AT ANY PRICE
PLASTIC COATED BOTH SIDES

on welding cover lens cost

We challenge you to prove this claim. Send for a FREE sample and see why we say "Thermo Triple Duty Cover Lens are guaranteed to cost less per welding foot than any other regardless of type" Send for your's today.

THERMO SPIRAL TIP CLEANERS
Exclusive spiral design cleans faster without scratching or enlarging orifice. Guaranteed unbreakable.
(Set of 12 in handy metal case.)

THERMACOTE CO.
NEWARK · CHICAGO · LOS ANGELES

WAGNER
ELECTRODE HOLDERS

mean
— Engineering at its Best!
— Dependability, Economy, Safety!

- "STREAMLINE" — Low center of gravity trigger for quick one-hand rod release — saving time in production WELDING.
- HIGH HEAT RESISTANCE — Glass fiber insulation for Jaw covers give greater strength with longer life.
- WAGNERLOY — High Arc Resistant copper alloy used in tong members.
- CHANNEL CONSTRUCTION — In tong members for more rapid heat dissipation.
- SPRING TENSION ADJUSTMENT — for proper rod grip and ease of spring replacement.

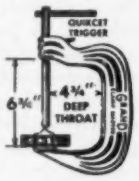
WAGNER MFG. CO.
350 W. 1st SOUTH ST.
JACKSON, MISSOURI

Weld with Wagner

GRAND
SPEED CLAMPS
A S L SERIES

SAVE MINUTES ON EVERY CLAMPING OPERATION!

Grand Speed Clamps are quick setting and instant releasing—just push down the screw and tighten with a turn on the vise-type handle. Trigger releases work instantly.



Grand Speed Clamps have extra deep throats—are ruggedly built of NACO No. 6 Steel—spatter proofed.
4 Sizes: 2" to 8" Opening

Famous GRAND "C" Clamps
Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

Ask Your Supplier

GRAND SPECIALTIES CO.
3101 W. GRAND AVE., CHICAGO 22

JAMES P. DEMPSEY has been appointed manager of employee and plant community relations for the Welding Department of General Electric Co., York, Pa. He joined G-E as labor relations assistant at the Bridgeport Works in 1949. Prior to his new appointment, he was assistant to the plant manager in charge of employee relations at the York plant.

* * *

On the occasion of his 80th birthday, J. P. H. WASSERMAN came from Switzerland to attend the National Metal Exposition and to visit with his son, RENE D. WASSERMAN, who is president of Eutectic Welding Alloys Corp., Flushing, N. Y. In 1906, the elder Mr. Wasserman observed the phenomenon of surface alloying in brazing for the first time. He adapted it into his process of non-fusion welding, which was later perfected by his son René, who, in 1940, founded Eutectic in New York.

* * *

DR. ERNEST F. NIPPES, head of welding research at Rensselaer Polytechnic Institute, Troy, N. Y., and member of the metallurgical engineering faculty, is conducting a program of research for the Detroit Arsenal of the Army's Ordnance Corps. Under the contract between the Arsenal and the Institute, Dr. Nippes and his associates at Rensselaer are making an engineering study to determine the residual stresses in welded titanium joints.

* * *

HARRY H. ARMSTRONG has been named to handle distributor sales for the building products division of American Welding and Mfg. Co., Warren, O. He formerly was St. Louis zone manager for F. C. Russell Co. He also served as assistant regional manager for Reynolds Metals Co. in Chicago.

* * *

Three new members were recently elected to the board of directors of the American Platinum Works, Newark, N. J., one of the Engelhard Industries group. Named were: WILLIAM J. WAGNITZ, general sales manager; JOHN F. THOMPSON, JR., sales manager for the silver-brazing alloy division; OTTO W. LANGHANS, works manager.

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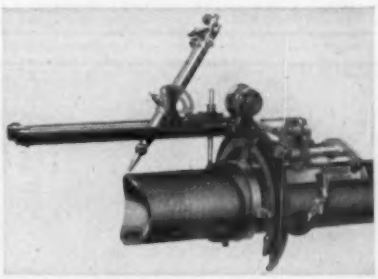
Yeh, Joe won the contract all right . . . the whole ding-blasted works . . . miles and miles of pipe fabrication and some of the darndest shapes to cut you ever saw! Joe lost money on that job. Oh sure, he made a profit, but he could have made more — lots more — with the H & M Shape-Cutter and Beveler. Joe didn't know it but the H & M could have saved **90% of his time** on those contour cutting problems. With the H & M Shape-Cutter all you do is attach the desired cutting pattern to the machine . . . slip the machine over the pipe and snap in place . . . light the torch . . . give the hand crank a few turns . . . and the job is done — the maximum SPEED WITH ACCURACY. Joe had a few choice words for those reject welds too . . . the H & M certainly could have saved him a lot of fuss and bother. If you're in the same fix as Joe get all the details . . .



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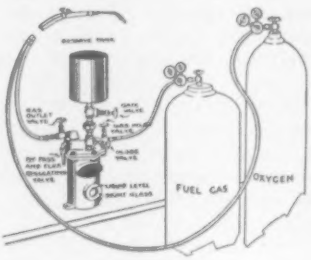

GASFLUX customers are making these savings. A manufacturer of high quality sheet metal cabinets turned to brazing to get rid of brittle welds and distortion, only to run into a costly flux removal problem. The GASFLUX process solved it.

In another plant, the GASFLUX process reduced leakers in tube connections, doubled penetration of the brazing alloy. On sheet metal assemblies it improved production 25%. We shall be glad to send you full details on request.

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U.S. Patent No. 2,429,581
In Canada 1948

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MATTHEW M. LAWLER has been elected vice-president in charge of the air conditioning and refrigeration division for the Worthington Corp. Mr. Lawler joined the Worthington Corp. in 1936 and has served in the capacity of assistant vice-president and manager of the air conditioning and refrigeration sales division since 1950. He has been associated with pioneering and development of the industry for many years. He is a member of the board and executive committee of the Air Conditioning and Refrigeration Institute.

* * *

FRANK V. LOCKEFER has been named director of sales for the Tennessee Fabricating Co., Memphis. He will direct the national sales activities of the ornamental iron company. He was formerly president and general manager of the Mid-States Welder Mfg. Co., Chicago.

* * *

E. W. BULLARD, president of the E. D. Bullard Co., San Francisco, has been appointed to the research committee of President Eisenhower's Committee on Occupational Safety. The commission was established to maintain a workable standard safety code in all United States industry.

* * *

Three promotions were recently announced by Sylvania Electric Products, Inc., EDWARD P. ATCHERLEY was appointed merchandising manager for renewal tube sales. BRUCE McEVOY succeeds Mr. Atcherley as regional sales manager for renewal sales in the Midwest district, with headquarters in Chicago. JOHN P. VAIL has been named manager of the East Central district, succeeding Mr. McEvoy.

* * *

W. F. HEFFERNAN has been appointed district sales manager in the newly-opened New York sales offices of Southwest Welding & Mfg. Co., whose home offices are in Alhambra, Calif.

* * *

Two field engineers have been appointed by Norton Co., Worcester, Mass. BURTON G. EBBESON has been appointed to the Worcester area with headquarters at the main Norton plant. CHARLES M. WELLONS will be a field engineer working out of the Philadelphia district office.

30 YEARS AGO

(Taken from THE WELDING ENGINEER *of November, 1923)*

ARC-WELDED storage tanks, with a floating roof, are described in this issue. The new type of tank, built at a Chicago iron works plant, cuts down fire losses and evaporation.

—30 YEARS AGO—

AS THIS issue of THE WELDING ENGINEER goes to press, the International Acetylene Association is holding its 24th convention in the Hotel Sherman, Chicago. Registrations indicate the attendance will break previous records.

—30 YEARS AGO—

AN interesting decision was rendered in the Circuit Court at Chippewa Falls, Wis., recently. Judge E. C. Higbee, sitting for Judge James Wickham, directed a verdict ordering a Chippewa County farmer to pay for an acetylene lighting plant. The farmer had refused to accept it on the claim it was dangerous to use.

—30 YEARS AGO—

LORN CAMPBELL and Lorn Campbell, Jr., have returned from their trip to Europe and are back on the job with United States Welding Co., Minneapolis. They report a pleasant and interesting trip, as well as a profitable one. They were successful in making important business arrangements with well-known European firms.

—30 YEARS AGO—

AT A meeting of the American Welding Society, Metropolitan Section, New York, Major James Caldwell, managing director of Alloy Welding Processes, Ltd., London, read a paper on "Fluxes and Their Functions in Electric Arc Welding."

—30 YEARS AGO—

THE Louisiana Oxygen Co., Inc., New Orleans, was recently elected to active membership in the Gas Products Association. The Pittsburgh Reinforced Brazing and Machine Co. has been elected an associate member.

—30 YEARS AGO—

A. J. RUSSELL, president of the Bettendorf Oxygen-Hydrogen Co., Bettendorf, Ia., made the experiment this year of taking two weeks' vacation. He doesn't furnish any statistics on the fish he caught but says he had so much fun that he contemplates making it an annual event.

—30 YEARS AGO—

THE United States Welding Co., Minneapolis, is announcing a contest for welding operators in an endeavor to make weldors take more interest in the quality of their work.

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EYEGARD IMPERIAL COVER GOGGLES

fit over the largest prescription glasses

#500 WELDERS COVER GOGGLES with baffled side shields

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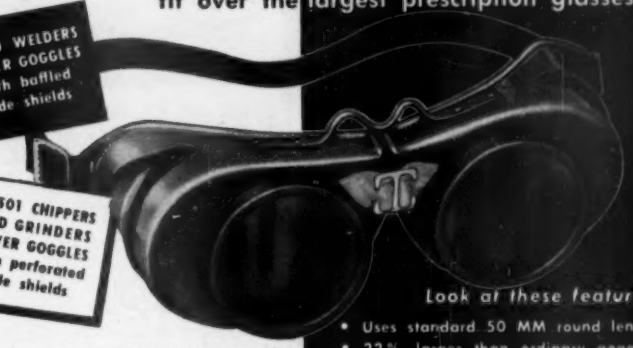

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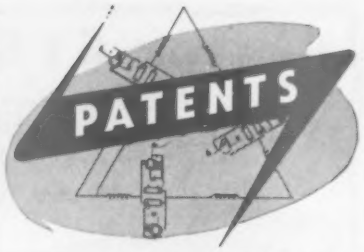
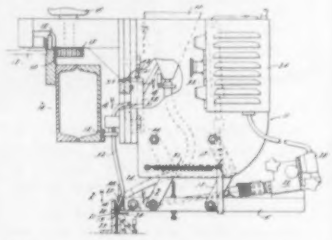


Cleaning Flux Off Rods

2,646,649. EUGENE E. RHODES, Dearborn, and HARRY G. SCHOLTZ, Wyandotte, Mich. Assigned to The Murray Corp. of America, Detroit. Filed Feb. 4, 1952. Granted July 28, 1953.



This patent refers to a device for removing adhered flux from the end of a welding rod. It includes a cylinder and a piston in the cylinder having a recessed central part. A supply conduit to the cylinder communicates with the recessed part when the piston is in retracted position. Means are provided for retracting the piston. A conduit is connected to the opposite end of the cylinder for delivering air to the opposite end of the piston from that containing the retracting means. The cylinder has a by-pass passageway extending from the top end to the recessed part of the piston when the piston is in delivering position. A delivering conduit is on the cylinder from which the flux granules in the recessed area of the piston are forced by the by-passed air from the top of the piston when the piston is near the end of its stroke to delivering position.

* * *

Flash Welding Spatter-Guard

2,642,517. ARTHUR L. LINDOW, Macedonia, O. Assigned to The Cleveland Pneumatic Tool Co., Cleveland. Filed Nov. 13, 1951. Granted June 16, 1953.

A newly patented method of shielding butt flash welded tubular members from spatter include inserting into each tube next to the welding joint a combustible tubular shield. The shield is of sufficient thickness to assure rigidity. It is prevented from burning (due to the welding heat) by removing oxygen from the shield. After welding, the shields are burned off and removed with the spatter from the inside walls clinging to them.

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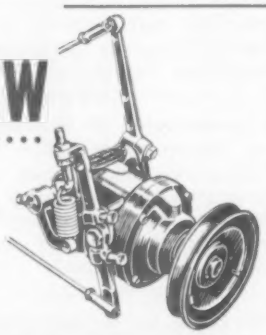

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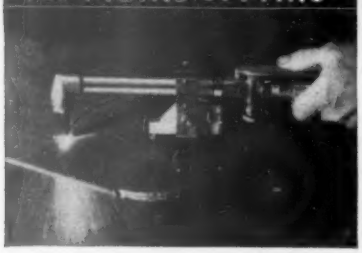
THREE NEW GUIDES for METAL CUTTING



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The new NEECO guides are of three types —for small circles (shown above), for large circles, and for straight lines.

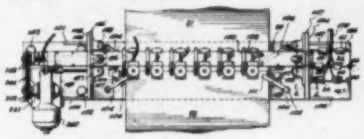
Write for illustrated Bulletin 101 and model selection data.

NEECO *Precision Flame Cutting — Fast and Exact!*

NEW ERA ENGINEERING COMPANY
458 West 29th St., Chicago 16, Illinois

Inert-Gas Welding Apparatus

2,645,703. Robert E. Dahl, Hinsdale, Ill. Assigned one-half to Advance Transformer Co., Chicago. Filed March 8, 1951. Granted July 14, 1953.

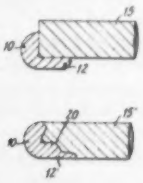


This patent refers to a machine for welding a butt joint between two workpieces. It includes a carriage having a number of welding heads adjustably mounted on it, a mandrel upon the support and means for moving the heads into welding position upon the support. Means for moving the carriage a distance equal to that between welding heads (plus a small overlap) is provided. Means are provided for initiating operation of the carriage moving mechanism and also for moving the heads into welding position simultaneously with starting the operation of the machine. Means are provided for leading electrical current to the welding heads shortly after starting the apparatus. When the trailing weld head reaches the edge of the members, means are provided for stopping the flow of electrical current to the first head shortly before the end of the stroke of the carriage. Other means stop the flow of current to the other heads and stop the movement of the carriage and move the welding heads out of position—all simultaneously—when the end of the stroke is reached.

* * *

Welded T-Joint

2,642,652. Raymond C. Davis, Dayton, O. Assigned to General Motors Corp., Detroit. Filed Jan. 30, 1951. Granted June 23, 1953.



This patent covers the steps in the method of making a welded T-joint between two solid metal rods. First, a notch is coined in only one-half of the cross section of one of the rods. Simultaneously, the displaced metal is thereby caused to flow outwardly for forming a lip projection. The end of the second rod is inserted into the notch and in contact with and overlying the projecting lip. The rods are then welded at the notched portion.

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Welding Goggles Won World Fame Because of Ventilating Feature

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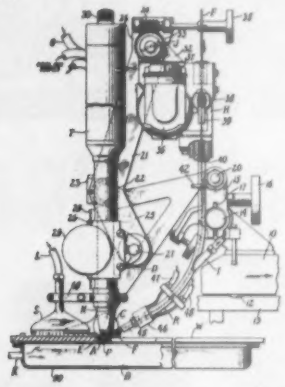
Comfortable, Top Quality Eye and Face Safeguards

622 N. Aberdeen St. Chicago 22, Ill.

Inert-Gas Rod Feed

2,644,070. HARRY T. HERBST, Belleville, N. J. Assigned by mesne assignments to Union Carbide and Carbon Corp., New York City. This application June 23, 1949. Granted June 30, 1953.



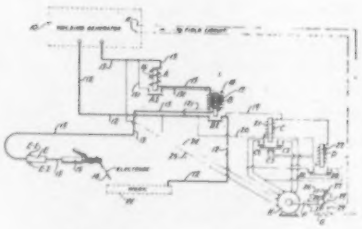
This patent refers to a method of inert-gas blanketed arc welding metals which comprises maintaining an electric arc between the tip of an electrode and a welding zone of the metal to be welded. An annular stream of gas containing essentially inert, noble, monatomic gas along and concentric with the electrode blankets the arc and molten parts of the metal during welding. Means are provided for advancing the welding zone and blanket along a line of weld. This includes advancing a separate stream of gas containing essentially inert, noble, monatomic gas apart from but in tandem with the first mentioned gas stream on the same side of the metal being welded and distributed along the line of weld to blanket the welded joint following behind the welding zone.

* * *

Welding Thin Sheets

2,641,674. HOWARD S. ORR and ALFRED TEPLITZ, Pittsburgh, Pa. Assigned to United States Steel Corp. Filed Dec. 3, 1951. Granted June 9, 1953.

This patent covers a method of joining two thin metallic sheets and includes adhesively attaching a thin platen of metal (whose conductivity is higher than that of the two sheets) to one of the pieces next to its edge. An edge of the other sheet is lapped over the edge of the first piece and over the platen. The platen is then adhesively attached to the second sheet. An electrical resistance weld is then made on the lapped edges of the sheets through the platen.



Remote Arc Control

2,642,515. EARLE W. BAGG, Sans Souci, Mich. Filed Oct. 30, 1950. Granted June 16, 1953.

A newly patented device for controlling welding current from a welding generator at the work station includes a reversible electric motor-driven rheostat for regulating the field current. A welding and a control relay system is located at the generator. A welding current lead goes from the generator to the electrode and a ground lead goes from the generator to the work. The welding relay is normally open and closeable responsive to striking the arc. The said control relay system includes two relays, each closeable responsive to the application of a different definite current value lower than the welding current value. This closes a circuit from the generator to the motor-driven rheostat. One relay and circuit drive the motor in one direction turning the rheostat to decrease the welding current. Two resistances, each of a different capacity, are connected to the welding current lead at the welding site. Each has a free contact applicable to the work to selectively introduce either different definite resistance into the control relay system and actuate one or the other of the said relays.

* * *

Offset Welding Lens

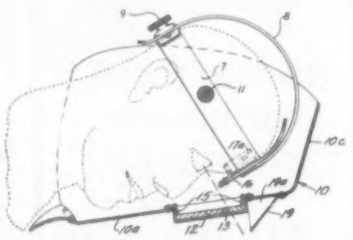
2,644,160. JOSEPH H. JACOBS, Minneapolis. Assigned to Jacobs Wind Electric Co., Minneapolis. Filed Dec. 10, 1951. Granted July 7, 1953.

Newly patented face and eye protective apparatus for weldors comprises an inwardly concave, outwardly convex opaque shield adapted to receive and enclose the front part of a weldor's head and face. It has an opening in the upper front part aligned with the weldor's eyes when in operative position. A pair of lens members is mounted in the opening and close the same. One of the lenses is highly restrictive to the passage of light through it and permits a weldor to view an arc when directing his line of sight to it. It is placed in a plane normal to the line of sight to prevent distortion of the transmitted light rays. The restrictive lens has a relatively large vertical depth. The other lens is transparent to permit viewing therethrough under normal light. It is placed above the light restrictive lens and lies in a plane disposed in rearwardly spaced, substantially parallel relation to the plane of the restrictive lens. It has a relatively small vertical depth to limit the light rays passing therethrough. An outer opaque visor is mounted across the upper part of the front of the shield above the upper transparent lens.

* * *

Welding Helmet

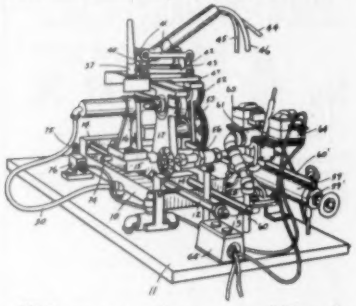
2,644,159. JOSEPH H. JACOBS, Minneapolis. Assigned to Jacobs Wind Electric Co., Minneapolis. Filed Sept. 17, 1951. Granted July 7, 1953.



This patent covers a helmet for weldors and comprises a protective shield made from opaque material. Means are provided for pivotally mounting the shield on the head of a wearer with the front part of the shield disposed in forwardly-spaced relation to the wearer's face when the shield is in downwardly-swung, operative position. The front shield portion has a viewing opening formed therein. A double lens structure is mounted in the opening and completely closes it. One part of the lens is constructed to restrict the passage of light rays through it to permit viewing of a high intensity light source such as a welding arc and forming the lower section of the double lens structure. The upper section of the double lens is transparent to permit viewing of the work under normal lighting conditions. A visor is positioned in rearwardly opposed relation to the transparent lens part with the lower edge of the visor disposed directly inwardly from the lower edge of the transparent lens when in operative position. It is spaced between the upper part of the wearer's head and the transparent section whereby the weldor may tilt his head downwardly to direct his line of sight below the lower edge of the visor and through the transparent section. By merely tilting his head upwardly, he interposes the light restrictive lens between his eyes and the light source to be produced.

Arc Welding Machine

2,646,493. CHARLES R. MOON, Muncie, Ind. Assigned to Ontario Mfg. Co., Muncie, Ind. Filed March 26, 1951. Granted July 21, 1953.



This patent refers to a welding device for joining a linear and curvilinear joint between the edges of two positioned pieces of material having quite thin walls. An arc welding fixture has a welding electrode supported so that it remains at a fixed angle with respect to the joint. Means are provided for holding the workpieces with their edges in the proper relationship to the electrode. Other means operate to linearly and curvilinearly feed the holding means past the welding electrode. Other devices move the electrode supporting apparatus to maintain constant the space between the electrode and the joint irrespective of the variations in contour of the joint.

* * *

Rotatable Ground Clamp

2,642,560. JOHN L. ELKINS, Long Beach, Calif. Filed Sept. 27, 1949. Granted June 16, 1953.

This patent refers to a welding ground clamp which includes a plate having jaws formed in it. The jaws serve to removably fasten the plate to the side walls of a pipe. A housing is supported from the plate. A ball bearing assembly with an inner and outer race has the outer race supported in the housing and remains fixed with regard to it. A member has a flanged end and a threaded portion extending through the inner race. A nut engages the threaded part and cooperates with the flange to grasp the inner race between them. A lock screw engages a bore formed in the nut and threaded part to hold the member and inner race together as an integral unit and prevent the flange coming in contact with the housing. A bolt extends outwardly from the threaded part. A nut engages the bolt to hold the terminal of a cable in position thereon. The terminal is situated between the nuts and hangs downwardly at all times irrespective of the rotation of the pipe to which the device is affixed.

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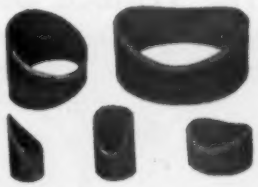

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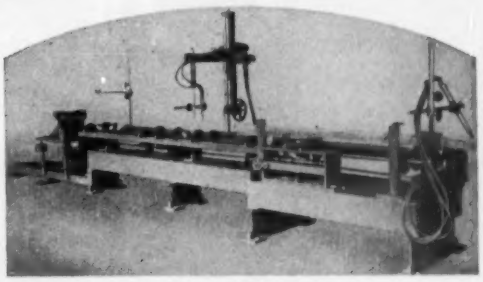

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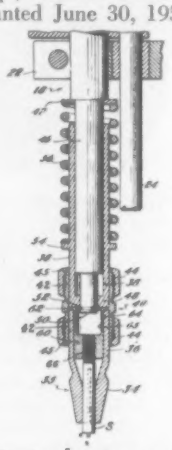
Stud Welding Gun

2,644,068. HAROLD J. GRAHAM, Highland Park, Mich. Assigned to Graham Mfg. Corp., Detroit. Filed Jan. 17, 1950. Granted June 30, 1953.



This patent refers to a welding gun having a power-operated actuator for exerting forging pressure as a stud is being welded to a workpiece. A sleeve is slidably mounted on the actuator. A chuck is fastened to the end of the sleeve for securing the stud. Within the sleeve is an anvil part coaxially positioned to the actuator to receive a direct blow from it. Means are provided for mounting the actuator and the chuck at a distance from the work piece to determine a given initial separation between stud and work piece. Elastic means are interposed between the sleeve and the actuator for initially moving the chuck conjointly with the actuator to bring the stud into contact with the work piece. The elastic means are deformed by the movement of the actuator after the contact of the workpiece by the stud and before imparting of the blow to the anvil part. The amount of deformation of the elastic means is sufficient to absorb the rebound of the actuator subsequent to the blow. It maintains the chuck relatively stationary so that the stud remains in contact with the workpiece during welding.

• • •

Seam Welding Apparatus

2,646,491. CLYDE E. COATES and ARTHUR L. WILLIAMS, Warren, O. Assigned to Federal Machine & Welder Co., Warren, O. Filed Feb. 1, 1952. Granted July 21, 1953.

A newly-patented apparatus for joining lapping edges of sheet material comprises seam welding wheels rotatable about an axis and also shiftable longitudinally of the axis. The wheels are engageable with the lapping edges in seam-forming relation and are moved along it to form a seam. Provision is made for turning the plane of rotation of the wheels.

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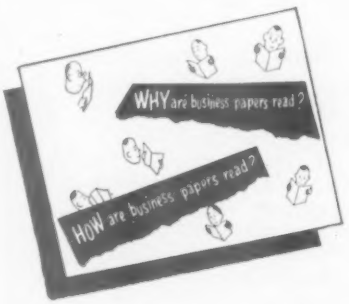

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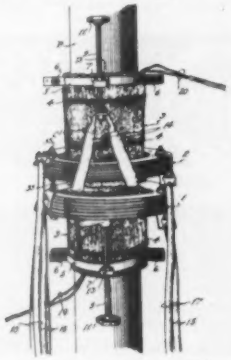
McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N. Y.

Preheating Weldments

2,649,529. HARRY B. SMITH, Westfield, and GEORGE A. DOLAN, East Orange, N. J. Filed Jan. 5, 1951. Granted Aug. 18, 1953.



This patented process of butt welding metallic members together consists of applying unitary coil windings in relatively close relationship around the adjacent joint parts of said members. An alternating current is passed through the windings to establish strong alternating electromagnetic fields uniformly around the parts. This induces relatively quick preheating. The coil windings are quickly moved a distance apart to permit operating on the joint. When the arc-welding of the joints has been completed, the coils are quickly moved to a position that will enable the weld to be properly normalized with a controlled current.

* * *

Stud-Welding Method

2,648,748. CHARLES A. SAYER, London, England. Assigned to Cyc-Arc Ltd., London, England. Filed April 28, 1950. Granted Aug. 11, 1953.

In this patented method for arc welding studs to plates, the stud and plate are connected in the welding circuit as the electrodes. Current of a limited value at full voltage is caused to flow from a source of supply of current in the welding circuit and between the stud and plate while they are in contact. While the current of limited value continues to flow, the stud is separated the determined arcing distance from the plate. This forms an arc of low intensity. The current in the welding circuit is subsequently increased to full strength for development of the arc into the full welding arc. After a determined interval, the stud is returned to the plate to effect the weld. The flow of current is continued to complete the weld.

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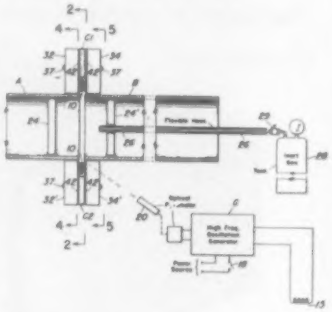
Induction Heating

2,649,527. EDWARD CORBIN CHAPMAN and ROY LORENTZ, JR., Chattanooga, Tenn. Assigned to Combustion Engineering, Inc. Filed Jan. 18, 1951. Granted Aug. 18, 1953.



This patent concerns an apparatus for butt welding ends of metal tubes. It provides a means for holding the tube ends in aligned relation. An initial axial gap separates the ends. An induction-heating conductor of relatively narrow axial width encircles the extreme edge portions of the aligned tube ends. When energized, the conductor creates a narrow field of high frequency alternating magnetic flux. This flux imparts inductive heating largely to the edge portions. Pluglike baffles are inserted into the tube to block substantial escape of gas. One of the baffles is provided with an opening. A conduit connects with this opening and extends through the interior of the metal tube, carrying the baffle to and out of the remote end of that tube. The apparatus provides for a source of inert gas external to the remote tube end. Means are provided whereby the conduit is connected to the gas source. The gas flows through the conduit and baffle opening, filling the tube-end space between the baffles. It then flows radially out past the tube end edges through the axial separating gap. The outflowing gas serves to bathe the tube end metal in a way which prevents contamination by air while the metal is being heated to welding temperature by the flux.

Wrong Picture

THE WELDING ENGINEER used the wrong picture in identifying a new "Kool-Mitt" on page 86 (middle column) of the October issue. Apologies to Singer Glove Mfg. Co., Chicago, manufacturers of the "Kool-Mitt" and to Heat-Ray Safety Leathers, Inc., Mount Vernon, N. Y., whose picture was used in error.

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Welding Engineer, published monthly (2 issues in June) at Chicago, Illinois, for October 1, 1953.

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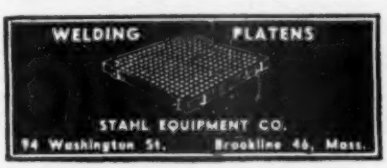

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A

Air Reduction Sales Co. 15, 99
Allen Co., L. B. 102
Alloy Rods Company 85
All-State Welding Alloys Co., Inc. 96
American Brass Co., The 65
American Chain & Cable Co., Inc. 73
American Ind. Safety Equip. Co. 95
American Manganese Steel Div. 11
American Optical Company 14
American Solder & Flux Company 80
Ampco Metal, Inc. 54, 70
Anti-Borax Compound Co. 100
Arcos Corp. 88, 89
Aro Spot Welders, Inc. 101

B

Belden Mfg. Co. ..... Inside Front Cover
Bernard Welding Equipment Co. 58
Bethlehem Steel Company 19
Bridgeport Brass Co. 83
Burdett Oxygen Co., The 57

C

Carborundum Co., The ..... Inside Back Cover
Chicago Boiler Company 100
Chicago Eye Shield Company 2
Cincinnati Tool Company, The 86
Cogmatic Company 70
Contour Marker Corp. 84

D

Dalweld Company 84
Diamonite Products, Division of U. S. Quarry Tile Company 50
Dice Company, J. W. 92
Dockson Corp. 52

E

Eastman Kodak Company 53
Eutectic Welding Alloys Corp. 49, 102

F

Federal Machine & Welder Co. 76

G

Gasflux Company 94
General Electric Company 8-9
Goldsmith Bros. Smelting & Refining Co. 68
Grand Specialties Co. 93

H

H & M Pipe Beveling Machine Co. 93
Harnischfeger Corp. 78, 79
Harris Calorific Co., The 77
Hewitt-Robins, Inc. 10
Hobart Bros. Co. 1

I

Independent Eng. Co., Inc. 82
International Nickel Co., Inc. 16

J

Jackson Products 4
Johnson Mfg. Co., Inc. 86

K

Krembs & Co. 102
KSM Products, Inc. 74

L

Lincoln Electric Co., The 12-13
Linde Air Products Co., A Div. of Union Carbide & Carbon Corp. 47, 91

M

Maitlen & Benson, Inc. 94
Mallory & Co., Inc., P. R. 22
Metal Bond Mfg. Co. 90
Metal & Thermit Corp. 87
Miller Electric Mfg. Co. 20
Modern Engineering Co., Inc. 72

N

National Carbide Corp. 72
National Cylinder Gas Company 75
National Welding Equipment Co. 7
New Era Engineering Company 97

P

Page Steel & Wire Division 73
Pennsylvania Optical Company 69
Phoenix Products Co. 80
Pierce Governor Co., Inc., The 96

R

Rankin Mfg. Company 101
Reed Engineering Company 86
Ross Operating Valves Co. 61

S

Selnky Bros. 59
Sellstrom Mfg. Company 97
Sight Feed Generator Company 90
Smith Corp., A. O. ..... Back Cover
Smith Welding Equipment Co. 90
Standard Research, Inc. 82
Stulz-Sickles Co. 95
Sylvania Electric Products 81

T

Taylor Winfield Corp. 64
Tempil Corp. 104
Thermacote Company 92
Tillman Co., John 96
Tweco Products Co. 82

U

Union Carbide & Carbon Corp., Linde Air Products Co. 47, 91
United States Steel Corp. 71
United States Steel Supply 71
United Wire & Supply Corp. 92

V

Vernon Tool Co., Ltd. 99
Victor Equipment Co. ..... inserts binds bet. 18-19
Viking Division of Progressive Welder Sales Co. 63

W

Wagner Mfg. Company 93
Welding Alloys Mfg. Co. 97
Weldwire Company, Inc. 100
Westinghouse Electric Co. 66-67
Worthington Corporation 55

SEARCHLIGHT SECTION
(Classified Advertising
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 102, 103
Selling Opportunities Offered 102

EDUCATIONAL
Schools 102, 103

BUSINESS OPPORTUNITIES
Offered 103

NOTICES
Legal 103

EQUIPMENT
(Used or Surplus New)
For Rent 103
For Sale 103

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